The United States MILLER

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Instructions to Engineers.

BY R. MOORE.

Getting up Steam.—Before lighting the fire in the morning, raise your safety valve, brushing away all the ashes and dust which may impair its free action, and if it leaks steam grind it on its seat with fine emery or grindstone grit. Valves with vibratory stems are safer than those with rigid stems, as they are not so liable to bind by the lever and weight getting out of true. To guard against loss by leakage and evaporation, leave the water up to the third guage at night and keep it up to the second guage during working hours. Clean all ashes and cinders from tne furnace and ash pit, and spread a layer of two or three inches of coal over the grate bars; pile on plenty of shavings over the coal, with dry sawdust, split wood, &c , then start your fire. Keep the fire even and regular over the grade bars, about 5 inches thick with soft coal, and about 3 inches with anthracite, and always avoid excessive firing. Moderate charges or firings at intervals of 15 to 20 minutes give the best results. In getting up steam from *cold* water the fire should be raised gradually, to avoid damaging the boiler by unequal expansion of the iron. Do not keep the damper and furnace door open at the same time, as the extreme draught expels the heat from the furnace into the chimney, and the cold air entering through the door induces a damaging contraction of the boiler plates wherever it strikes. The current of air enters the ash pit with a velocity of 12 feet per second, and every 100 lbs. coal requires about 15.524 cubic feet for its combustion. With *wood* for fuel, the area of grate surface should be 1.25 to 1.4 that for coal. Volume of furnace for *coal* burning should be from 2.75 to 3 cubic feet for every square foot of its grate surface, for *wood* 4.6 to 5 cubic feet. The use of the pyrometer has satisfactorily established the following facts: 1st. That the admission of a certain quantity of air behind the bridge developes a greater amount of heat for raising steam by assisting combustion and consuming the smoke, the existence of smoke being always a sure sign of waste. 2. A regular and continuous supply of air to the furnace increases its heating powers 33½ per cent. 3. The supply of air may enter behind the bridge, through the bars, or through the furnace doors, as long as it is properly regulated. 4. The supply of air may vary with the nature of the fuel; light burning coal requiring less air than caking coal, because the latter becomes a compact mass in the furnace, excluding the air from the bars, while the latter is the reverse. 5. For perfect combustion a high temperature is necessary. In all cases see that the bars are well covered and the fuel kept from caking. Knock away the clinkers as soon as formed, keeping the spaces open between the bars. Regulate the supply of air either by the dampers, ashpit, furnace doors, or by an orifice behind the bridge. A jet of steam from a pipe placed across the top of, and inside the door, will greatly assist in consuming the smoke and intensifying the heat, by yielding up its oxygen and hydrogen.

If steam commences to blow off at the safety valve while the engine is at rest, start your pump or injector to create a circulation, cover or bank your fire with a charge of ashes or fresh coal to absorb the heat, and allow the steam to have free egress through the safety valve. If by neglect the water gets very low, and the boiler dangerously hot, the fire should either be drawn, or drenched with water. Should the fire be very hot and the water supply temporarily cut off, stop the engine and cover the fire quite thickly with fresh fuel to absorb the heat, keeping the usual allowance of water in the boiler until the supply is renewed. Boilers should be blown out every 2 or 3 weeks, or as often as mud appears in the water, but never until after the fire has been drawn at least one hour, and the damper closed, otherwise the empty boiler might be damaged by the heat. Never fill a *hot* boiler with *cold* water, as the sudden contraction many times repeated will eventually cause it to leak. Never blow out a boiler with a higher pressure than 50 lbs. to the square inch, as steam at a high pressure indicates a high temperature in the iron, which under careful management should always be led down gradually. Previous to filling a boiler raise the valve to permit the free egress of the air which might otherwise do manifold damage.

Use every possible precaution against using foul water as it induces foaming in the boiler; soapy or oily substances and an insufficiency of steam room have a like effect, causing the boiler to burn on the spots where the water is lifted from it, and the glass guages to indicate falsely, besides damaging the cylinder by priming, carrying mud, grit, water and slush into it through the pipe, and rendering the cylinder heads liable to be knocked out. Steam from pure water at 212 degrees Fahr. supports a 30 inch column of mercury. Steam from sea, or impure water at the same temperature, will support only 22 inches.

Pure soft water derived from lakes and large streams, rain water from cisterns, reservoirs, &c., and springs *outside of limestone districts*, is the best for steam purposes. Water from wells and springs *in limestone districts* and small streams, hold in solution large quantities of chloride of sodium, carbonate of lime, sulphate of lime, &c., besides quantities of vegetable matter in suspension. The carbonic acid in the water, which holds the carbonate of lime, &c., in solution, being driven off by boiling, the latter is precipitated and forms an incrustation which adheres with obstinate tenacity to the boiler plates. By continual accretion the deposit of scale becomes thicker and thicker, and being a non-conductor of heat it requires 60 per cent more fuel to raise the water to any given temperature when the scale is ¼ of an inch thick; the conducting power of scale compared with that of iron being as 1 to 37. The red scale formed from water impregnated with salts of iron, derived from percolation through iron ore, is still more mischievous and destructive to steam boilers. In no way can the evil be completely averted except by boiling the water to drive off the carbonic acid, but this is sometimes impracticable, although many feed water heaters are in successful operation.

In tubular boilers, the hand holes should be opened frequently and all sediment removed from over the fire; keep the sheets, flues, tubes, gauge cocks, glass guages and connections well swept and perfectly clean, and the boiler and engine-room in neat condition. Keep a sharp look out for leaks, and repair them if possible without delay, and allow no water to come in contact with the exterior of the boiler under any circumstances. Examine and repair every blister as soon as it appears, and make frequent and thorough examinations of the boiler with a small steel hammer.

In case of foaming, close the throttle, and keep closed long enough to show true level of water. If the water level is right, feeding and blowing will generally stop the trouble. With muddy water it is a safe rule to blow out 6 or 8 inches every day. If foaming is violent from dirty water, or change from salt to fresh, or from fresh to salt, in addition to following the above directions, check draugth, and cover the fires with ashes or fresh fuel.

Great watchfulness is necessary when steam is raised, the safety valve fixed, the fire strong and the engine at rest. In every case there is a rapid and dangerous absorption of heat, the temperature latent and sensible heat included, often rising to 1200 degree Fahr. Frequently it is but the work of an instant to convert the latent into sensible heat, thus generating an irresistible force which bursts the boiler and destroys life and property. The destruction generally coming at the moment of starting the engine, the opening of the valve inducing a commotion in the water, which flashes into steam the instant it touches the heated plates. Steam has been known to rise from a pressure of 32 lbs. to the square inch to 90 lbs. to the square inch, in the short space of *seven* minutes, with the engine at rest. It ought to quicken the vigilance of every engineer to know that the explosive energy in each and every cubic foot of water in his boiler at 60 lbs. pressure, is equal to that contained in 1 lb. of gunpowder.

From avaricious motives it has become quite common to discharge, or to decline to employ, qualified and careful engineers. Incompetent men are employed because their labor costs a few dollars less than that of the former. This is too much of a bad thing to pass over without notice. Employ good skillful men in the management of steam power, or employ none at all, and pay them decent wages. If an oversight takes place, and the best and careful men are liable to make mistakes, never scold, reprimand, or exact service during dangerous emergencies, as in the event of lost water in the boiler. In no case risk life, limb, or property, and do not let the consideration of saving a few dollars debar you from securing intelligent assistants. The Turkish mode of driving business on a late occasion was to discharge the English engineers who brought out the war vessels which they built in England, and supply the vacancies by installing cheap green hands. After getting up steam the new "Chief" proceeded to start the engines. A lift at a crank produced no results, a pull at a lever was equally useless. At length the illustrious official espied a bright brass cock, and thinking he had got hold of a sure thing this time, proceeded to give it a twist, when he was suddenly saluted with a jet of steam full in the face, which swept the "engineer" and his assistants out of the engine room, into the fire room down stairs. So much for cheap labor and the consequent results.

Duties to the Engine when under Steam.—Before starting the engine, warm the cylinder by admitting steam so as to slowly move the piston back and forth, letting the condensed water flow from the drip-cocks, which should be left open all night for this purpose; especially should this be done during cold and frosty weather, during which time all pipes and connections should have extra protection. The minimum speed of the piston should be 240 ft. per minute. and the maximum speed 700 ft. in any engine. The most economical steam pressure is from 80 to 90 lbs. to the square inch, on the piston of any high pressure steam engine. To attain this it is necessary that the boiler pressure should be considerably higher, for there is a loss of at least 30 per cent., arising from the irregularity of the steam pipes and steam ports, by radiation or heat, by improper packing, by friction of valve, by the effect of the governor and by atmospheric pressure, which of itself entails a loss of 15 lbs. per square inch on the piston. The lower the steam pressure per square inch on the piston, the greater the loss of power from the atmospheric pressure; for instance, a steam pressure of 30 lbs. per square inch on the piston, leaves only 15 lbs. per square inch effective pressure for actual work, the other 15 lbs. being required to overcome atmospheric pressure.

In tightening piston rod packing, screw no tighter than merely to prevent leakage; any more consumes power by friction, and will destroy the packing. Spring packing in the cylinder should be adjusted with great care, always kept up to its place, and never allowed to become loose, or leakage will ensue, causing loss of power. On the other hand, if it is set too tight it will cut the cylinder, and loss will result from friction. Keep your packing free from grit, sand, filings, &c., as such substances will cut the cylinder and flute the rod. Remove all old packing before inserting new, observing to cut the packing into proper lengths, and breaking joints by placing each joint on opposite sides of the stuffing box. Keep the governor clean, easy in its movements, and avoid excessive tight packing around the spindle. Use good oils. Avoid waste in the use of oil, as too great profusion generates gum and dirt. Use it with judgment in combination with concentrated ley when it is required to remove gum or dirt from these or other parts of the machinery. Do not lubricate the cylinder until after starting the engine, and using the drip cocks. If you have occasion to separate a rust joint, or any crank from a shaft on which it has been shrunk, the simplest plan is to apply heat, when the bodies being of different dimensions will expand unequally and separate.

Iron when heated expands with irresistible force. Railway contractors know that the heat of the sun on a warm day will cause such an extension of the iron, that the rails, if laid with close joints, will rise with the sleepers from the ballast, and form arches 4 or 5 feet high and from 50 to 60 feet in length. In accommadation to this law of expansion, spaces are left between the rails on railway tracks.

The contraction of iron by cold is equally powerful, and has been put to good use in truing up large bulging buildings by fitting iron girders across them with strong wall plates at each end. Then, by applying gas jets all along the girders they will expand; the screws are then tightened up, and the girders allowed to cool, and the strain of these contractions several times repeated is sufficient to bring the walls to the perpendicular. Again, in hoisting heavy machinery, etc., by means of pulley-blocks, if the ropes stretch and the blocks come together too soon, wet the rope, and the object will be elevated by its contraction without any other force. These hints will be found useful when occasion offers.

In driving the kegs on the crank-pin and cross-head, use a leaden mallet, or interpose a piece of leather, or a sheet of soft metal for protection, if a steel hammer is used.

The piston should be removed every six months, and the parts injured by friction, etc. carefully ground, fitted, and if need be turned, trued, and made steam tight. If knocking occurs in the engine it may arise by the crank being ahead of the steam; if so, move the eccentric further back; if caused by the exhaust closing too soon, enlarge the exhaust chamber in the valve; if caused by the engine being out of line, or by hard or tight piston rod packing, these faults must be corrected; if caused by lost motion in the jam nuts on the valve, uncover the steam chest and adjust them correctly. It may be that knocking is caused by lost motion in the crank-pin, pillow-blocks, key of the piston in the cross-head, or boxes on the cross-head, if so, tighten the key, or file off the edges of the boxes if they are too tight. Should knocking arise from shoulders becoming worn on the ends of the guides from any cause, replace the guides. Knocking may be caused by insufficient counterboring in the cylinder, causing derangement in the movements of the piston. The remedy for this is to *re-counterbore* the cylinder to the proper depth.

Keep a close watch over the journals of the crank and cross-head, if they are loose in the boxes, or too tight, they will run badly; if tightened too much, they will heat and wear out the brass shoes; if not tight enough there is danger of the keys flying out and breaking the engine.

Be sure that your steam gauge indicates truthfully. It ought to tell accurately the *pressure of steam* in the boiler when the water is hotter than 220° Fahr., and indicate the *variation* in the pressure of steam from time to time; but many gauges are much worse than the contrivance used by the colored engineer, who, disdainfully dispensing with a gauge altogether, used to ascertain the critical moment when steam was up, or danger at hand, by clapping his open hand on the outside of the boiler.

UNITED STATES MILLER.

E. HARRISON CAWKER, EDITOR.

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MILWAUKEE, FEBRUARY, 1880.

THE UNITED STATES MILLER has now commenced its eighth volume, and has become universally acknowledged to be one of the most valuable milling journals in America, both for the purpose of transmitting knowledge on milling and mechanical subjects and as an advertising medium for introducing and selling all kinds of modern milling machinery. It is our aim to meet the wants of our patrons, whether manufacturers or consumers. Our editorial course will be entirely independent, and we shall do our best to give our readers the benefit of the latest important news on subjects pertaining to the objects of this paper. Our circulation and advertising patronage cover all sections of the country We do not deal in machinery ourselves, and consequently have no "*axes to grind.*" We cordially invite all those who have already patronized us to continue their patronage, and those who have not to try our columns. We append herewith our

ADVERTISING RATES FOR 1880.

	1 mo.	3 mos.	3 mos.	6 mos.	1 year.
One inch card	$ 2 00	$ 4 00	$ 5 50	$10 00	$20 00
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Business editorial matter per line, 30 cents. If over 50 lines, 25 cents.

Illustrations charged for in proportion to space occupied.

Advertising for Millers wishing situations, or millers wanting to engage employes, 50 cents.

MILL FOR SALE advertisements, $2 each insertion.

Subscription price to the UNITED STATES MILLER, $1 per year.

M'Lean's Millers' Text Book, which every miller should have. Price by mail, 60 cents, post paid.

Ropp's Easy Calculator, which every business man should have in his pocket or on his desk. Price by mail, post paid, FIFTY CENTS.

Our Job Printing Department is one of the finest in the State, and particular attention is paid to all kinds of commercial work, which we can do on the most reasonable terms. Parties desiring to publish catalogues, circulars, etc., should send for estimates.

Address all communications to the

UNITED STATES MILLER,
Milwaukee, Wis., U. S. A.

We respectfully request our readers when they write to persons or firms advertising in this paper, to mention that their advertisement was seen in the UNITED STATES MILLER. *You will thereby oblige not only this paper, but the advertisers.*

READ the advertisement of James Hill in this number and write for prices, etc.

WANTED.—Any of our readers who have a spare copy of the UNITED STATES MILLER for July, 1879, will confer a favor on us by sending it to us.

HON. ALEX. H. SMITH, President of the Missouri Millers' Association, has recently been elected President of the St. Louis Merchants' Exchange.

THE Stillwell & Bierce Mfg. Co., of Dayton, Ohio, have just shipped a Victor water wheel to James Scott, River Forth, Tasmania, Australia, to drive his flouring mill. Merit and enterprise will tell the world over.

MILLERS examining the prices for the Combined Cockle Separator and Dustless Oat Separator, manufactured by the Cockle Separator Manufacturing Co. of Milwaukee, Wisc., will find that they can buy these machines combined for the same price that they would have to pay for an oat separator alone.

THE Chicago *Mining Review* is authority for the statement that J. Silas Leas, of the Barnard & Leas Mfg. Co., of Moline, Ill., has become interested in some Colorado mines. Col. Collins, of Chicago, has successfully invested in mining operations. Who will be the next mill furnisher to seek to realize a golden dream.

A NEW MILLSTONE MATERIAL.—We have recently received a specimen of a manufactured millstone material made by the North Carolina Millstone Co. of Carthage, N. C. It is said to do excellent work, and the company are making arrangements for its extensive introduction. Millers visiting Milwaukee can see the sample at our office.

Edward P. Allis & Co. are building a 28x60 Reynolds-Corliss engine for the Valley Lumber Company of Eau Claire, Wis.

The flour mill of Henry Slater, at St. Paul, Minn., was destroyed by fire New Years day. Loss $15,000 on mill, which also contained a quantity of wheat and flour worth probably $2,000; insurance, 7,500.

The Secretary of the English Millers' Mutual Insurance Co. report the losses for the past six months at about $30. One of the imperative rules of the Company, on all risks, is to have buckets of water kept on each floor, at all times, for use in case of necessity.

THERE are five millers in the Wisconsin State Assembly for 1880, with names, politics and ages as follows: Beattie, Republican, Dane County, 49 years of age; Krueger, Democrat, Outagamie, 56 years; Anderson, Republican, Waupaca, 51 years; Bean, Greenbacker, Winnebago, 53 years; McIntyre, Republican, Sheboygan, 37 years.

THE *Practical American* is the name of a new independent scientific journal edited and published by P. H. Vander Weyde, M. D., who has for many years been the editor of the *Manufacturer & Builder*. This new journal is ably edited and handsomely illustrated, and will no doubt soon become very popular. The price of subscription is $1.50 per year, and the office of publication is at 34 Park Row, New York City.

MILLERS before buying Oat Separators or Wheat Grades should first write to the Cockle Separator Manufacturing Company of Milwaukee for their illustrated catalogue, in which a full description and illustration of the combined Cockle Oat Separator and Wheat Grader is given. This machine took the highest medal at the Seventh Cincinnati Industrial Exhibition for the best separator and Grader.

PATENTS ISSUED LAST YEAR.—In 1879 there were 19,300 applications for patents, of which 12,471 were granted. There were 828 patents withheld for non-payment of the final fee of $20. The total receipts of the Patent Office was $703,146.79; total expenditures, $548,-651.47. The receipts above expenditures was $154,495.32. By this it will appear that the inventors not only have to pay the actual expenses of having their rights secured to them, but a large amount in excess,

AT the regular meeting of the Executive Committee of the proposed Western Manufacturers Mutual Ins. Co., held at their office, at No. 130 La Salle Street, Chicago, on the 12th day of January, 1880, Messrs. Wm. G. McCormick and P. A. Montgomery were respectively elected Manager and Secretary for the ensuing year, or until the final incorporation of the Company.

Mr. Wm. G. McCormick, the present manager, is well known in Chicago and the West as a successful and energetic financier, and underwriter. Mr. P. A. Montgomery, the present Secretary, is well and favorably known, personally to most of the Millers and Underwriters of the Northwest, having been connected with the Miller's National Ins. Co., of Chicago, since its organization.

The business of this Association is in a flourishing condition, and, with an excellent class of risks, and constantly increasing membership its future prosperity is assured.

The Millers' Exposition for 1880.

We are pleased to note the interest taken in all quarters in the coming Exposition of milling machinery to be held in Cincinnati in June next. A large party of British and Irish millers and manufacturers of milling machinery are coming. Another party, which it is presumable will be quite large, is organizing in Germany and Austria and it is probable the number will include some well known German writers on milling subjects. We have received information that at least two gentlemen from France highly interested in milling will be on hand. Congress has passed a joint resolution authorizing the importation of milling machinery and supplies for Exposition purposes free of duty, and there is now no doubt but there will be a great number of such exhibits. The applications already for space have been abundant. The committees in charge of the enterprise are kept hard at work, and they will endeavor to make everything as satisfactory to exhibitors and visitors as possible. We hope every miller in this country will make up his mind to visit the Exposition. The expense will be little compared to the information to be gained.

Millers' International Exhibition.

TEST TRIALS OF STEAM ENGINES.

Among the many special attractions to be offered by the Millers' International Exhibition the most interesting will be the trials of steam engines, for which the Commissioners are now preparing, with the intention to have these trials superior to any ever made in the history of steam engineering. Many attempts have been made by the European and American International Expositions, and by the American Institute and the Cincinnati Industrial Expositions, to bring together the principal automatic cut-off engines built in this and other countries, but with only partial success. The Paris Exposition Universelle of 1867 had but the Porter-Allen engine and a small Corliss engine built by the Corliss Steam Engine Co., Providence. At the Vienna Exposition of 1873 the only automatic engines exhibited were two types of the Corliss engine by European builders. At the Paris Exposition of 1878, the only automatic engine was a Wheelock. The Centennial Exposition, 1876, had a Corliss, Buckye, a Brown and an upright automatic engine; but at none of these Expositions were test-trials made to determine the absolute and relative economy of the several engines exhibited, and of the three celebrated test-trials which have been made upon the automatic cut-off steam engines. Cincinnati enjoys the credit of having made two of those. At the Fair of the American Institute, New York, 1869, test-trials were made upon the Harris, Corliss, and Babcock & Wilcox engines, with an award of premium upon the record to William A. Harris, of Providence, R. I. At the Cincinnati Industrial Exposition of 1874, test-trials were made upon the Harris, Corliss, and Babcock & Wilcox engines, with an award of premium upon the record to William A. Harris, of Providence, R. I. At the Cincinnati Industrial Exposition of 1875, test-trials were made upon the Harris, Corliss, and Buckeye engines, with an award of premium upon the record to William A. Harris, of Providence, R. I. The last Cincinnati Industrial Exposition contained a single automatic engine, the "Brown," but no trials were made of it. In no instance have the engines complied with the conditions necessary to arrive at a correct estimate of their relative value. The Harris-Corliss engines have always been carefully built and set, and as carefully handled, but the Babcock & Wilcox engine at New York, was set on a poor foundation, and the Babcock & Wilcox engine, at Cincinnati, suffered from defects of workmanship. The Buckeye was but half the size—in point of capacity—of the Harris-Corliss engine, and all efforts heretofore made to place competing engines upon precisely the same level have failed. In the trials projected by the Commissioners of the Millers' International Exhibition, the engines will be precisely alike in diameter of cylinder, and worked at uniform piston speed. Each competing engine will be tested, condensing and non condensing, and the loads carried will be the same for all engines. The engines will be worked under precisely uniform conditions for all trials, and the test of absolute and relative economy will be based upon the net steam consumed. The trials will be under the immediate direction of Mr. John W. Hill, with a carefully selected corps of assistants, and will be conducted in accordance with the code of regulations.

Six engines will be entered for trial, four of which—the Harris-Corliss, Buckeye, Wheelock and Brown—have already been assigned space. The remaining two will be located and announced in a few days. The award of premium will be made to the engine exhibiting the highest economy, condensing and non-condensing.

FERDINAND SCHUMACHER, of Akron, Ohio, is one of the busiest millers in the world. He owns three mills in Akron. The German Mills, with eleven run of stone and all appropriate machinery for manufacturing oatmeal, is driven by a steam engine. The Empire Barley Mills, driven by steam power, have 13 pearl barley machines and all other modern machinery for manufacturing food from barley. The Cascade Flouring Mills, driven by an iron overshot water-wheel 35 feet in diameter with 10 foot face, has twelve run of stone, two sets of rolls, and the best machinery for making new process flour. Aside from these mills, Mr. Schumacher has an elevator with a capacity for holding 136,000 bushels of grain, and he is the President of and principal owner of stock in the Peninsula Ending Stone Co. He employs continually over 100 men, and his sales during 1879 were over $1,000,000. His products are shipped to all portions of the world. Oatmeal branded "*German Mills Oatmeal*" has been pronounced unexcelled in quality by the celebrated "Royal Irish" or any other brand.

The Chemistry of Bread Making.

CANTOR LECTURES, BY PROF. GRAHAM, D. S., LONDON, ENGLAND.

Lecture I.—Delivered Nov. 24, 1879,

Ladies and Gentlemen—Some six years ago I had the honor of addressing an audience in this room, upon a subject closely allied to that which will engage our attention on this and each succeeding Monday evening before the great festival of the Christian year. I refer to the course delivered by me on the "Chemistry of Brewing." The Council of the Society of Arts has again honored me by a request to give a Cantor course, on some application of science to the arts; and in selecting the Chemistry of Bread-making, I have been guided by a consideration of the vital necessity of food to the existence of man. As cereals are, of all the fruits of nature, the most important to man for their invaluable store of flesh-forming and heat-giving principles, the right method of preparing these for his use is one well worthy of the most attentive study. Although the cultivation of the cereals is beyond our present province, which is limited to the study of the phenomena of bread-making, I shall incidentally have to refer to the effect of climate—and more especially to the influence of the weather at the ripening and harvesting periods—on the character of the wheat garnered; and I shall show that unfavorable climatic conditions not only seriously affect the quantity, but also the quality of the grain.

It may be thought by some that there is little need for a scientific study of bread-making, since man has already attained a considerable degree of excellence in its manufacture. This is true, but much remains to be done ere all inferior productions shall have given way to the loaf of unsurpassable excellence, and it is chiefly to science that we must look for a rapid development. It is true that in London we can, if we search for it, obtain bread of excellent quality, yet we all know there is much that is inferior throughout the country; nor can our average wheaten bread equal the average wheaten bread of France and Germany. This is, doubtless, partly due to the more favorable climatic conditions of those countries; but inasmuch as we import the best qualities of wheat from some of the most favored countries of the Old and New Worlds, the inferiority of our average bread cannot arise chiefly from our less favorable harvesting conditions, but rather from the less skill and knowledge possessed by many of our millers and bakers.

A fuller knowledge of the chemical phenomena of bread-making must not only be of great value to the baker, but also to the consumer of bread. In this respect we are all interested in the phenomena of fermentation; and later in this course I propose to direct your attention to the digestion of bread, which is a process of fermentation, and to the conditions requisite for its due fulfilment.

The historic aspect of our subject is lost in obscurity. Probably, soon after man learned to till the earth, and reap a rich cereal harvest from his toil, the grinding of corn, and the admixture with water and salt, and then its heating, would be resorted to. Thus unleavened bread is made, and the earliest attempt to prepare ground cereals for man's use has not ceased to be practiced. The oat cake of Scotland, and her pease and barley bannocks, the Passover bread of the Jews, the damper of the Australian shepherd, the American corn bread, are existing examples of that method of bread making. In many parts of Spain wheat flour is simply mixed with water and baked, not even salt being added. There, not only the most primitive of all methods of bread-making is still pursued, but even the separation of the grain from the straw is carried out, as in Biblical times, by the treading out of the corn in the fields by oxen; and although the bread is deficient in salt, it is rich enough in fine, gritty sand.

The next step and the most important one in the history of bread-making, whereby leaven was employed to lighten the product, is also or considerable antiquity. It is probable that the Chinese may have been the first to make leavened bread. Be thts as it may, we know that the Egyptians, in the time of Moses, understood the art, and from them the Greeks acquired the secret, and through the Greeks the Romans spread the knowledge, wherever their all-conquering and colonizing armies went. Leaven, although a great improvement on unfermented bread, acts slowly, and gives

rise to so much of high-colored products that it has, to a great extent, been replaced by yeast. The introduction of this important factor in bread-making probably took place soon after the art of making beer had obtained some degree of success, because the evolution of gas in the leavening process must have suggested the trial of yeast, which also evolves gas in the conversion of saccharine matter into beer. I have, however, been unable to find any authentic statement of its introduction in place of leaven. The preparation of leaven is still practised, and thus we have the unleavened, the leavened, and the yeast-fermented breads of the present day, but it is chiefly yeast-fermented breads which will occupy our attention throughout the course, although, incidentally, the spontaneous ferments of the leaven process will be considered.

Before we proceed to study the phenomena of bread-making, it will be needful to consider the constituents of the chief cereals, and to compare them, not only amongst themselves, but also with the more important articles of food employed by man. In the following table you will find a statement of the component parts of these cereals, wheat, barley, oats, rye, maize and rice,

Average Composition of the Grain of Cereals.

	Old Wh't	B'rly.	Oats.	Rye.	M'ze.	Rice.
Water	11.1	12.	14.2	14 3	11.5	10.8
Starch	62.3	52.7	56.1	54.9	54.8	78.8
Fat	1.2	2.6	4.6	2.0	4.7	0.1
Cellulose	8 3	11.5	1.0	6.4	14 9	0.2
Gum & Sugar	3.8	4.2	5.7	11.3	2.9	1.6
Albuminoids	10.9	13.2	16.0	8.8	8.9	7.2
Ash	1.6	2.8	2.2	1.8	1.6	0.9
Loss, etc	0.8	1.0	0.2	0.5	0.7	0.4
	100.00	100.00	100.00	100.00	100.00	100.00

Bearing some of these numbers in mind, if we take the following table prepared by Messrs, Lawes and Gilbert with reference to the articles of food most used by man, we find that the ratio of carbon to nitrogen, in the case of flour, is 38 to 1.7; in meat as 30 to 2; in potatoes as 11 to 3. We therefore notice that in the case of these cereals we have a considerable quantity of flesh-forming albuminoid matters, more especially in the case of wheat. I shall have again to refer to the subject of diet at a later period of the course.

Avarage Composition of Articles of Food (Laws and Gilbert.)

Foods.	Dry substance.	Carbon.	Nitrogen.	Nitrogen to 100 Carbon.
Per cent.	Pct.	Pct.	Pct.	Pct.
Meat (fresh)	45 0	30 0	2 0	6 6
Bacon (dried)	85 0	61 0	1 4	2 3
Butter	85 0	68 0	.....	.....
Milk	10 0	5 4	0 5	9 3
Cheese	60 0	36 0	4 5	12 5
Flour (wheaten)	85 0	38 0	1 72	4 5
Bread	64 0	28 5	1 29	4 5
Maize	87 0	40 0	1 75	4 4
Oatmeal	85 0	40 0	2 0	5 0
Rice	87 0	30 9	1 0	2 36
Potatoes	25 0	11 0	0 35	3 2
Vegetables (succulent)	15 0	6 0	0 2	3 3
Pease	85 0	39 0	3 65	9 4
Sugar	95 0	40 0	.....	.....

We may conveniently divide the constituents of the cereals into three great classes. In the first place, those constituents which, by being burnt up in the system, produces heat. They are the materials that we call carbo-hydrates: the starch, the gums, and the sugars; it is from the oxidation of these carbo-hydrates, and also from the fat in our food, that the greater portion of the force that man exerts is derived. The next great division it will be convenient to take is the albuminoids, or flesh-forming elements of the cereals; and lastly, the ash, which, although not great in quantity, is still most important in its bearing on the physiological phenomena which go on in the cells of animal life, and also because it is from the mineral matter of the ash that the bone structure of man is built up. Now, the mineral matter of the ash of wheat has been the subject of very lengthened investigations by numerous chemists. The series which, perhaps, on the whole are most complete and trustworthy, are those made by Messrs. Lawes and Gilbert, and those by Messrs. Way and Ogston.

Composition of Wheat Grain Ash.

	Lawes and Gilbert.	Way and Ogston.
Phosphoric acid	49.68	45.01
Phosphate of iron	2.36	0.82
Potash	29.35	31.44
Soda	1.12	2.71
Magnesia	10.70	12.36
Lime	3.40	3.52
Sulphuric acid	.....	0.34
Carbonic acid	.....	0.02
Chlorine	0.13	0.13
Silica, &c.	2.47	3.67
	92.21	100.03

We find from the former chemists' statements that the ash of wheat contains, in 100 parts, 49 of phosphoric acid; Way and Ogston say 45, so that nearly one-half consists of phosphoric acid. There is also a small quantity of phosphate of iron, but the next important constituent concerned is potash. That amounts to about 30 per cent. Lawes and Gilbert state, as the average of nine analyses, that they have found it to be 29.35; whereas the average of 26 analyses of various samples of wheat, by Way and Ogston, gives 31.44 phosphoric acid. Thus phosphoric acid amounts to nearly one-half, and potash one-third of the whole of the ash. The next important constituent is magnesia, amounting, according to Lawes and Gilbert, to 10.7, and to Way and Ogston, to 12.3. Lime, soda, and a small quantity of silica make up the remainder of the 100 parts. Phosphoric acid, a small quantity of iron, potash, and magnesia, are the characteristic constituents of the ash of wheat.

I will now proceed to examine somewhat fully the chief chemical and physical properties of the organic constituents of cereals, beginning with starch. I have here a table that indicates in our chemical language the composition of what we term the carbo-hydrates:.

Formulas of Carbo-hydrates.

Starch and Dextrin. } =(C1 2 H2 0 O1 0) n1 2

Cane Sugar and Maltose. } =(C1 2 H2 2 O1 1) n1 2

Dextrose. Lævulose. } =(C1 2 H2 4 O1 2) n1 2

We use that expression in order to indicate that hydrogen and oxygen are found in the carbo-hydrates, in precisely the same ratio as they occur in water. These two elements, hydrogen and oxygen, do not exist in starch or sugar as water. but they exist in the same proportion as they do in water, and that expression has been applied to all these bodies. In the case of starch and dextrin you will notice the formula given here (C12 H20 O10) has a small "n" added outside of it. The simplest formula which would represent our knowledge of the centesimal ratio of the carbon, hydrogen, and oxygen would be C6 H10 O5, but we shall hereafter see so small a formula is insufficient to explain a number of reactions we know of in reference to starch. The formula of starch must, therefore, be written (C6 H10 O5)n. I have thought the formula (C12 H20 O10)n—in which even the value of n is probably high—would best express to those not well conversant with chemical science the correlation of the various carbo-hydrates in the table.

The next subdivision of this important class of bodies embraces cane sugar and maltose, indeed I might also have included sugar of milk.

They are isomeric, that is to say, that they have precisely the same ratio of carbon, hydrogen and oxygen in their molecular composition, but they differ from the previous subgroups in having one of oxygen and two of hydrogen more in the formula given. The last subdivision of this group embraces the glucoses, the simplest formula expressing their molecular composition being $C^{12}H^{24}O^{12}$. Here also we notice an increase of two of hydrogen and one of oxygen over the cane sugar group, which differs from the starch group in the same manner.

It is to the first on our list of the carbo-hydrates that I have now to direct your attention. Starch is found in various vegetable structures, and for much the same purpose as fat is stored up in animals, for the future use of the organism.

It is thus found in pith. The sago of commerce is obtained by cutting down the sago plant and rasping the pith, and from that extracting the starch. It also occurs in bulbs, in tubers, such as the potato, in rhizomes and in roots; and it also occurs in seeds, either in what is called by the botanist the albumen of the seed, although it is not albumen from a chemical point of view, but it is called so because it is convenient to consider the stored up starch in ordinary grain by that name. If you take the caryopsis of wheat, the small embryo will be found at the bottom, surrounded by a large mass of starchy matter. It contains not merely starch, but also albuminoid bodies, and this, in botany, is called the albumen of the seed, for the reason that in the case of an ordinary hen's egg, the white of the egg surrounding the embryo is called albumen, and in both cases the albumen serves for the future growth of the young embryo. Starch is also found very largely in the fleshy cotyledons of some seeds, as, for instance, the ordinary bean, horse-chestnut, or pea, where practically the whole mass is made up of the two thick fleshy leaves that constitute the two halves of the whole seed, the young embryo being at the bottom. We see, therefore, that in all structures that are intended for the future growth of the plant, or, as in the case of seeds, for the reproduction of the new plant, that we have stored-up starch.

Starch was known to the Greeks; they called it *amulon*, indicating that it was not the product of a mill; they did not obtain starch from grinding the corn, but by bruising wheat, and by the employment of water they obtained this fine flour; and therefore, they called it flour made without a mill. This Greek word has given rise to the scientific word amylaceous, which is used to indicate bodies which contain starch. The method by which starch is obtained from wheat or potatoes is this: Formerly, it was entirely by a process of fermentation; the corn was roughly ground or bruised, then steeped in water, and allowed to remain for several days until spontaneous fermentation was set up, and the product of this fermentation consisted as usual, of carbonic acid gas, and its oxidised derivative, acetic acid. There was also lactic acid formed by the breaking up of the sugar. This, therefore, was a wasteful process. After the glutinous matter of the wheat had been sufficiently disintegrated and broken down, the whole mass was worked in a bag with water, and in that way the fine starch passed through the minute holes in the bag, and ultimately was subjected to repeated washings, in order to get rid of any trace of albuminous matter or glutinous principles that were left, and then it was dried. The process, however, was not only offensive from the putrefactive decay which went on, but it was also wasteful. In modern times, by much better mechanical rasping in the case of potatoes, grinding in the case of wheat and other materials employed, such as Indian corn, and rice, the principal amount of starch is obtained; but instead of allowing that to undergo fermentation, in order to decay or break up and get rid of the albuminous matter, caustic soda is employed to dissolve the albuminous matter. Caustic soda and caustic potash have the property of dissolving albuminous matters with great ease. You all know the soapy feel which the alkalies have when you rub them between your fingers, and you can very easily, by means of a solution of caustic alkali, dissolve out from an adulterated sample of wool the whole of the wool and leave only the cotton. It is in this way that the modern starch-maker gets rid of the small quantity of albuminous matter that may still remain in the starch after the grinding and washing process. This alkali dissolves away the albuminous matter, but has no action on the starch itself.

Now, starch, however obtained, consists of minute cells, and these cells differ in size and also in form, according to their origin. The cells obtained from potatoe are about 1-150th of an inch in diameter; those of sago are about 1-300th, the cells obtained from wheat are about 1-500th of an inch in diameter, and there are many smaller than those of wheat. The cell of potatoe starch, however, is larger than most, indeed, I think it is only exceeded in size by the cell of the maranta, and *Tous les mois*, arrowroots. All the starches have characteristic appearances under the microscope, and it is on account of the difference of form and the difference in size that we are able to detect adulteration; thus, when ordinary potato starch is mixed with arrowroot, or when some cheaper starch is mixed with sago, we are readily able, by means of the microscope, to detect and quantify the adulteration.

Starch is insoluble in cold water. Mr. Lewis—who has kindly volunteered his valuable services as demonstrator in this course—is now performing an experiment, which everyone in the room has seen, but which I wish to repeat, having shown that starch will not dissolve in cold water, He is now acting on the starch in such a way, by means of heat as to cause the little cells to be ruptured, and we shall then have the starch material, called granulose, pass out of the ruptured bag or cell, thus giving a solution or emulsion of the starch.

If to a solution of this boiled starch we add a little iodine, we obtain a blue precipitate, a combination of the iodine and starch so-called iodine of starch. With bromine, we get, not a blue, but a yellowish reaction. This reaction of bromine, on starch is so inferior, and of such very slight value in chemical investigations, that we rarely employ it; but the iodine reaction is remarkably sensitive, and by means of it we are able to detect very minute quantities of starch in various infusions in which these small quantities may exist. If we take some soluble starch, and add to it the liquid, called after its inventor, Fehlings solution, which consists of sulphate of copper, or blue stone, to which Rochelle salt, or the double tartrate of potash and soda is added, and then rendered distinctly alkaline, by excess of soda, many organic substances, when added to such a solution as this of Fehling's, have no action, even upon being heated; but in the case of some we shall find there is a distinct action. Now, soluble starch does not produce any apparent action to you. I shall presently show you, when we come to consider one of the sugars derived from soluble starch, that we have a distinct attack upon the oxide of copper, which, in this liquid is associated with sulphuric acid, as sulphate or protoxide of copper. The oxide of copper is deprived of one-half its oxygen, which goes to oxidise the sugar, and a red sub-oxide of copper is formed, which you will presently see.

Another interesting matter that I wish to draw your attention to, is the action of soluble albuminoids upon starch. I have here an analysis that represents the chief class of albuminous bodies, such as white of egg, and bodies analogous to it.

If we take any substance containing an albuminoid, and it will be convenient for our purpose to take an infusion of ordinary malt, we shall find that on the broken, unboiled, cells of starch, the infusion of malt will have very little action. The infusion of malt itself contains some sugars, and unfortunately, it is not easy to obtain from a vegetable infusion, albuminoids without at the same time having sugar products formed, but at any rate you will be able to see a marked difference between the action which takes place when malt infusion is added to unboiled starch, and when it is added to a starch in which the cells have been previously burst and the granulose matter allowed to exude from the rupture. This is some starch to which malt infusion was added. You saw it was blue before adding the Fehling's liquid and it is blue now, after boiling, in other words, there is nothing that is reducing or taking away the oxygen from the oxide of copper. It still remains the ordinary protoxide. In this other tube, previous to the malt infusion being added, the solution of starch was boiled, that is to say, the starch cells were broken up by boiling, and here you see there is an action on the oxide of copper, which must be perceptible at the other end of the room. That is a reaction by which some sugars decompose oxide of copper, robbing it of half its oxygen. This reaction only takes place near the boiling point, so we are obliged to heat such solutions. You see now the production of a yellow color, rapidly changing to red. (The experiment was here made.)

The reason I have shown you this experiment, is that I shall have occasion to refer hereafter, to a very interesting process by which the baker long ago found out, before scientific men were able to tell him anything about it, the importance of using the material called in the trade, "fruit." This is simply potatoes. They do not take unboiled potatoes, but they boil the potatoes thoroughly, so as to entirely destroy the cell wall, and to allow the whole of the matter to exude from the cells; then they add this preparation, together with a small quantity of flour, to the yeast, in order to prepare what they called "ferment." The object in doing so I shall hereafter explain to you, and it is a most ingenious and able application of empirical science to bread-making, by which as small an abstraction and degradation as possible of the albuminoid matters, and of the starch of the flour, is allowed to take place, and yet a sufficiently abundant disengagement of carbonic acid as is necessary to make a light porous bread is brought about.

Mr. Lewis will now take this infusion of starch and add to it a small quantity of dilute sulphuric acid—hydrochloric acid would do equally well—he will boil it for a short time, and you will find the starch is converted into sugar. You will remember I showed you that Fehling's liquid is not affected by the simple solution of starch, but if we take the solution of starch and boil it for a short time with dilute sulphuric acid, or hydrochloric acid, we shall convert the starch into sugar bodies. I shall have occasion hereafter to direct your attention for some time to the nature of the various sugar bodies—maltose, dextrin, and so on—that are formed in such cases, as they arrive. I shall be able to show that the same action has taken place by making use again of this valuable re-agent of Fehling.

(To be continued).

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THE new mill being built in Milwaukee, destined to have when finished 100 run of stone, is to be called "The New Era Mill."

THE importations of bolting cloth for the year 1879 were $10,000 less in value than during 1878. Bolting cloth is admitted free of duty.

THE manufacture of flour in Chicago has been gradually decreasing since 1868, in which year 732,479 barrels were made to 1879, when the entire product was only 292,000.

THE flour mills at Saukville, Wis., were built by Messrs. Smith Bros., the well-known millwrights of this city. They were credited to another firm in our last issue by mistake.

IN some of the Eastern States "Plaster, Flour and Feed Mills" are not very uncommon. It is probable that this is the reason we occasionally hear stories about plaster being mixed with flour to give it weight.

WE call the attention of our readers to the advertisement of the Western Manufacturers' Mutual Insurance Co., of Chicago., Ill. The company is doing a good business and insures flour mills against loss or damage by fire. Write them for further information.

As we go to press a gentleman just arrived from Minneapolis, says that a company is now being organized in that city for the immediate erection of a flour mill which will have a capacity of 5,000 barrels per 24 hours, and will be the largest mill, by far, in the world. Rollers and millstones will both be used.

THE adoption of the cental system by the New York Produce Exchange has been indefinitely postponed. In some parts of Great Britain a desire to return to the old way is expressed, and the probabilities seem to be that the old-fashioned way will prevail for a long time to come.

A SHIP recently sailed from Stonington, Conn., for Mexico, loaded with material for the new Tehuantepec railroad, which will connect the Gulf of Tehuantepec on the Pacific coast with the Gulf of Mexico. More than 1,000 miles, it is claimed, will be saved over the Panama route.

IT is stated that a prominent firm of iron brokers, H. E. Collins & Co., Pittsburg, Pa., recently made contracts for 400,000 tons of Mediterranean iron ores for this country. The members of the firm are said to deprecate publication, lest it might interfere with the making of contracts for Lake Superior and other native ores.

NEW YORK INVENTORS' INSTITUTE.—Peter Cooper has passed over $30,000 to the Cooper Union, in New York, for the purpose of adding another story to the building, which will be occupied by the Inventors' Institute. The work will be completed by December. The object of the Inventors' Institute is to give the inventors the free use of a library of all the works which they may desire to consult.

INFORMATION WANTED.—An Indiana miller writes us as follows: "About three or four months ago I saw a statement in some milling paper, made by a miller, who made a solution to wash his burrs and after leaving it on over night found in the morning on the stone a mineral deposit resembling a diamond. Will you or some of your readers inform me who the party was, or what the solution consisted of and oblige me?"

A TELEPHONIC FEAT.—A telephone test was made Jan. 26th between Omaha and St. Louis, a distance of 400 miles. It was completed successfully, conversation being carried on plainly. "The Sweet By and By" was sung in St. Louis in a clear baritone voice, and every note was distinctly heard in Omaha; then it was repeated there for the benefit of St. Louis. Several leading telegraph officials present at each end of the line were deeply interested in the test. It is believed to be the greatest distance successfully operated by a telephone.

THE highest and lowest price of No. 2 wheat in this market each year, for the past twenty years:

Years.	Highest.	Lowest.
1860	1 15	65
1861	93¼	68
1862	1 04½	70
1863	1 35	88
1864	2 26	1 14
1865	1 77	98
1866	2 29	1 16
1867	2 96	1 62
1868	2 11½	1 15
1869	1 48½	78½
1870	1 35	73
1871	1 32	1 01
1872	1 56½	1 02
1873	1 41	95¼
1874	1 31½	84
1875	1 34	85
1876	1 28	90
1877	1 90	1 03½
1878	1 30	77⅞
1879	1 31	82⅛

LOBBYING.—And now has come that season of the year when Congress and the State legislatures are in session, and everybody or class of bodies that have legislative "axes to grind" hie them away to the state or national capitols, and at once become lobbyists. This body of lobbyists has come to be called the "Third house," and exceeds in numbers and frequently in ability (to judge by occasional results) the legislatures themselves. At present it is said that the Washington lobby is strongly reinforced by representatives from foreign countries, notably Great Britain who are making the strongest efforts to get Congress to tinker with the tariff question. There are perhaps some things about the tariff that it might be well to change, but on the whole it is best to let well enough alone. Business has improved to a wonderful degree in the past few months, and is now in a healthy condition, and we hope no legislative action will be encouraged that tends to interfere with our commercial prosperity.

A doctor went out for a day's hunting, and, on coming home, complained that he hadn't killed anything. "That's because you didn't attend to your legitimate business," said his wife.

Present Condition of the Flour Milling Interests.

The speculative prices which have prevailed in the wheat market of late have seriously affected the flour industry in the United States. Many mills have deemed it expedient to shut down until the break in the market came, which the majority have expected would come soon. The high prices offered have had the effect of drawing almost all the wheat from the farmers' hands, and one of the most discouraging features so far as Western milling interests are concerned is, that so great a portion of our Western wheat has been shipped to seaboard ports from whence it will go abroad in an unmanufactured state, to foreign countries, thus depriving our millers of the manufacturing profit, which they naturally feel they are entitled to. Thus the consequence of this accumulation of wheat in our Eastern ports will be the means of our exporting largely of wheat instead of flour, and reversing tne condition of affairs from what they should be. This, of course, will please the millers across the water, and as a British contemporary says "seems too good to be true." As matters stand at the present writing, perhaps not one third of the mills in this country are running to full capacity, but most all that are in need of repairs or new machinery are taking advantage of the present occasion to fix up and seem to have no apprehensions but what there will be enough to do in the near future. A greater acreage of winter wheat has been put in than ever before, and the time is now not far distant when another, and it seems probable, abundant harvest will be at hand.

AROUND THE WORLD.—The *Railway Age* calculates the time of a trip around the world at 180 days and the cost at from $849 to $608, according as first-class or second-class rates are paid. Under the first head are included these entries: New York to San Francisco, $129; sleeping car, $22; meals on the road, $19; San Francisco to Sydney, $200; expenses in Sydney, $40; Sydney to Melbourne, $25; expenses in Melbourne $40; Melbourne to Adelaide, $25; expenses in Adelaide, $40; Adelaide to London, in sailing ship, $225; England to New York, $75. It is admitted, however, that a little extra money will not come amiss. No allowance is made for expenses in England.

Progressive Humanity.

The different successive stages of the development of the human race can be divided into six ages, which may be properly designated by some discovery or invention which had a marked influence on the condition of human society, both materially and mentally. Those ages are: 1, the age of stone; 2, the age of bronze; 3, the age of iron; 4, the age of the printing press; 5, the age of steam; and 6, the age of science.

This division must be understood in such a way, that, while during the previous ages, say of stone, bronze, or iron, mankind was utterly ignorant of the discoveries of succeeding ages, the latter multiplied more and more the appliances of the former ages, so that now in the age of science more stone, bronze, or iron is used than in the ages named after these materials.

1. THE STONE AGE.—Irreproachable evidence is accumulating more and more to prove that primitive man lived in a perfectly savage condition; that he did not know the use of metals, but made his tools and arms for attack and defense of stone. We find large tribes of mankind still in this condition, such as our North American Indians, the Australians, New Zealanders, Kaffers, Esquimaux, etc. Man in this condition has no accumulation of property, no division of labor, no proper organization, and no written laws, while population being scant, large tracts of land are occupied by few

2. THE AGE OF BRONZE.—As man was a savage in the stone age, so he was still a barbarian in the bronze age. In this age the invention of working metals, according to a Masonic legend attributed to Tubal Kain, was the great prime motor which elevated man from savagism, and resulted in the construction of tools for agriculture, which ended in the settlement on fixed homesteads; while the invention of metallic edged tools resulted in the better construction of dwellings of stone and wood, and the consequent building of cities, with their accumulation of property and population. The first nations who had elevated themselves from savagism up to barbarism were the ancient Egyptians, Assyrians, Persians and Hindoos. They possessed the knowledge of an alphabet, and had some books, but familiarity with the art of reading and writing was very scattered. They had no knowledge of free government, and no taste for fine literature and art. Some of the barbaric nations, however, elevated themselves to literary and artistic productions, so that the transition to the next age is very gradual.

It is difficult to determine the beginning of the bronze age, as it is buried in pre-historic times, of which there is no record; but its latter periods are very well known, comprising, as they do, the history of Greece and Rome, and are also known as the Pelasgian civilization, which ended about the year 450, by the overthrow of the Roman Empire by the Teutonic conquest. This constitutes a middle era, also called the dark ages, which ushered in the age of iron with the rise of Mohamedanism, the Crusades, and subsequently a new starting point for civilization.

3. THE AGE OF IRON.—This age is much interspersed with the preceding and following ages, as the introduction of this most useful of all metals was very gradual and steadily increasing, But the greatest change in the mutual relations of man was the result of the application of iron to fire-arms and the invention of gunpowder, which has rightly been called the great civilizer. It is not only a civilizer between nations, but between man and man. Before the invention of fire-arms, success in warfare depended more upon individual strength, but the use of gunpowder equalized man, because the bullet of the weak is as effective as the bullet of the strong, and the weak obtained thereby a means of defence by which they could shield themselves against brute force.

4. THE AGE OF THE PRINTING PRESS.—Printing was first invented in 1425, and about 1450 the new art began its influence over all Europe, especially for reason of the great additional invention of casting movable metallic types. From this period the attainmeut of knowledge among all classes became only a question of time; as books were now easily accessible, the importance of learning to read was felt by all, and the establishment of numerous schools was the result. Then the newspapers became such powerful leaders of opinion that despotic governments found it necessary to bridle the press. With all that the most important changes have resulted, such as the Reformation, with all its split-up sects, the establishments of governments by the people themselves, and many other startling changes, for all of which the printing press prepared the way, and has been found necessary to perpetuate them.

5. THE AGE OF STEAM.—During this age great changes took place in the condition of man; it may be reckoned to have begun in 1776, at the time of the birth of American Independence; it might also be called the age of coal, as on the latter the generation of steam mostly depends. It revolutionized the means of transportation by water and by land; it revolutionized metallurgy, and the working of metals in general; it gave birth to all kinds of machinery as used in manufacturing establishments and even in agriculture, so that there is scarcely anybody in civilized society who now does not enjoy its benefits.

6. THE AGE OF SCIENCE.—While the application of iron and steam are constantly spreading, a new era was ushered in about the year 1840, when photography was invented, and the electric telegraph begun to be generally introduced, which resulted in the laying of submarine cables connecting continents, and revolutionizing commerce. The invention of the telephone, of electric light, of the spectroscope and its applications, of photo-engraving and its application to printing, of the sewing-machines and scores of other labor-saving contrivances. At the other side the invention of iron-clad ships of war, powerful explosive torpedos, guns of large caliber, and other similar appliances give civilized nations great advantages, of which the use will be the spread of civilization in countries still inhabited by savages. Science is the most powerful agent to fulfill the manifest destiny of the world, as it will hasten the extinction of inferior and the survival of superior races.—*Practical American.*

An Englishman arrived in this country a few weeks ago, and as he stepped on the pier at New York a cable dispatch was placed in his hands summoning him home. Two hours later he sailed for London. It is now said that he intends to write a book descriptive of America and Americans. Heretofore Englishmen have been in this country at least two days before they have undertaken such a work.—*Norristown Herald.*

GRAIN.

Peculiarities in its Normal and Manufactured State.

An Investigation Under the Microscope—Showing the Adulterations and Natural Evils to which It has been Subjected.

A COMPLETE INVESTIGATION OF THE SUBJECT BY ONE OF THE LEADING CHEMISTS OF EUROPE.

Flour in General—Wheat Flour—Rye Flour—Barley Meal—Oat Meal—Indian Corn—Rice Meal.

[Translated from the German of Dr. Herman Klenck, expressly for the UNITED STATES MILLER,—cuts reproduced by our special engraver from the original.]

[*Concluded from January number.*]

OAT MEAL.

This is the ground kernel of *avena* sativa; when coarsely pulverized it is called oat-groats; when finely ground and sifted it is called oat-meal. Besides 59 to 62 per cent of starch oats contains a great percentage of a nitreous component which has been called "avenin," but which we have become familiar with under the technical name "gluten;" together with maize, oats also contain the greatest amount of fatty matter, and a comparing examination with wheat-flour leads to the following results:

	Water.	Gluten.	Fatty matter.	Starch.
Oat-meal.....	14	18	6	62
Wheat-flour.....	16	10	2	72

Moreover, the gluten, like that of barley, differs somewhat in its physical qualities from that of wheat and rye. The particles of starch by means of which it can be disclosed most readily, whether the object of examination is really oat-meal, have an easily distinguishable shape, they are smaller than those of wheat, varying but little in their diameter, many-sided in form, without any concentric rings, but with a cavity in the center and a thickened rim. It is peculiar that many particles of starch adhere to each other (fig. 27) and form lumps of round or oval shape, with apparently net-like surfaces. These lumps will easily become detached from each other when water is added, and they may then be seen either to escape their cells and float, or separate into single particles or smaller groups. Even when observed in polarized light they do not show the cross and star-shaped markings on the surface which occur so frequently in other kinds of grain, rye, for instance. Fig. 28 represents the membarnes of the husk of a grain of oats, in the longitudinal and cross section. Adulterations with other kinds of flour or substances are disclosed by the microscope, or, in some instances, by the modes of examination mentioned under the head of wheat-flour.

MAIZE OR INDIAN CORN.

Maize, Turkish wheat, also called Indian corn, Zea mais, is the largest species of grasses known; originally indigenous in tropical America, it is now being cultivated in all temparate zones, and the production of it in Europe is on the increase. This increase of the area of production has originated different varieties of the species, distinguishable by the size, color and shape of the kernels. Those varieties best known are dwarf-maize, quarantine-maize, restrate maize (where the seed-husk is prolonged into a point), Pennsylvania and Virginia maize, etc. All these kinds are rich in starch-meal, whereof they contain from 65 to 80 per cent on an average, and also contain a great amount of fatty matter. Indian corn meal has a light, straw color, the dough formed of it with water is less sticky and cohesive than the dough made of wheat-flour, and when thoroughly kneaded and treated in the well-known manner over a hair-sieve (fig. 18) there will remain a considerable quantity of yellow bran, but no gluten. This circumstance has rendered it somewhat more difficult to discern and estimate the amount of gluten maize contains, and has been the cause that in writings of chemists the statements are often decidedly contradictory. For instance, if Johnston or Payen inform us that maize contains as much as 12 per cent of gluten, this seems to contradict the assertions of others, who think the contents of gluten to be much less. The result is that some consider maize to be rich in gluten while others hold to the contrary. It is so, too, with the estimate of other components; Payen, for instance, analyzes as follows; Starch meal, 28.4; nitreous substance, 5; fat, 33.6; pigment, 0.2; cellulose, 20; dextrin, 2; different salts, 7.2, The chemist Graham has also found a mucous substance, yellow as wax, in maize, which he terms "zein." Maize also contains quite an amount of oil, which, when extracted with ether, will yield 4 per cent of a yellow oil. It is owing to this component that Indian corn meal, when exposed to the atmosphere for any length of time will become rancid, and it should, therefore, only be used when fresh. If Indian corn meal is boiled in water and a small quantity of weak tincture of iodine is added, a precipitate will be the result, which has the color of dregs of wine; if the mass is placed in some dark place for 12 hours the precipitate will become of a soiled white color, and the water above it milky. But if much of the weak solution of iodine has been added during the process of boiling, the precipitate will become rose colored, but when again subjected to the influence of light, after the lapse of 12 hours, it will lose its color. When treated with boiling water the mass of flour will in 12 hours have settled and will then be reduced to one-third in volume, and above it will be milky water which has separated from it, and which, when filtrated and mixed with tincture of iodine, will produce a violet-red precipitate. If one part of Indian corn meal is dissolved in 30 parts of a solution of corrosive kali, it will acquire a lemon color and become of a consistency like that of syrup. The liquid obtained therefrom, when still more diluted with water, will, when mixed with acetate of lead, yield a white precipitate of considerable quantity, which after the lapse of one hour will be 9-10 in volume of the whole. The specific weight of pure Indian corn meal is 1,023. If it is incinerated it will yield 1.30 per cent of ashes, which, according to the analysis of Letellier, have the following ingredients: kali and natron, 30.8; lime, 1.3; magnesia, 17; phosphoric acid 50.1; silicic acid, 0.8. We have here mentioned the principal qualities of Indian corn meal with regard to their action when under chemical influences; but the use of the microscope is a very important means of examination. And here the starch particles are again visible marks of distinction. The starch of Indian corn meal in general resembles that of oats, as regards the many-sided form of the particles, and the depression in the center, on the other hand, however, the particles are much larger, form no lumps, and under the influence of polarized light show distinct cross-shaped markings on the surface. The central cavity is indeed a characteristic of the form of starch particles of many grasses; with its thicker periphery it gives to the particles in general the appearance of the blood-vessels of mammals. The structure of the kernel of maize has a peculiar arrangement. The skin surrounding it consists of two membranes; the external is formed by 7 to 8 layers of cells, arranged in the same direction and about 3 times as long as wide; the rims of the lowest layer appear like a string of pearls; the inner membrane forms the surface of the seed-kernel and consists of only one layer of cells; the cells of the cellulose are angular, similar to those of rice, but divided up like a net by more numerous inner partition-walls, and in every one of these little spaces there is a separate particle of starch. As regards the adulterations, it has already been said that Indian corn is very frequently added to other and more valuable kinds of grain-flour. Means of discovering this deception we have described under the head of wheat-flour. But corn meal itself is often adulterated, and especially with potato-starch. Such adulterated corn meal has a less yellow color, usually has a soiled white hue, and causes a crackling noise when rubbed between the fingers. When boiled with water, the addition of a very small quantity of tincture of iodine will produce a precipitate which varies between blue and the color of dregs of wine; if this mass is put in some dark place for twelve hours, the precipitate will become of a soiled white hue and the liquid itself more or less turbid. If much of a weak solution of iodine has been added a blue precipitate will be produced, which will either partly or wholly lose its color after having been subjected to the influence of light for twelve hours. If boiling water is poured over Indian corn meal that has been adulterated with potato-starch, the result will be a precipitate which is more abundant than that produced by pure corn meal, and which varies according to the greater or smaller quantity of the admixture of potato-starch. The water above it will become milky and the smaller the amount of potato-starch present, the less water can be filtrated from it. With tincture of iodine this will then produce a violet, more or less blue precipitate. If one part of the mixed flour is added to 30 parts of a diluted solution of corrosive kali, a lemon color, more or less distinct, according to the amount of the admixture of starch, will be the result and the mass will possess more or less of the consistency of syrup; an admixture of acetate of lead to the liquid that has been still more diluted with water, will yield an abundance of white precipitate, which after the lapse of an hour will in volume be equal to the amount of the admixture of potato-starch. When making these examinations of suspected flour, it is advisable, however, to examine pure Indian corn meal with the same reagents at the the same time, and compare the results. Other tests by Lagrange we have mentioned while treating the subject of wheat-flour, showing methods aside from the use of the microscope in detecting the admixture of potato starch.

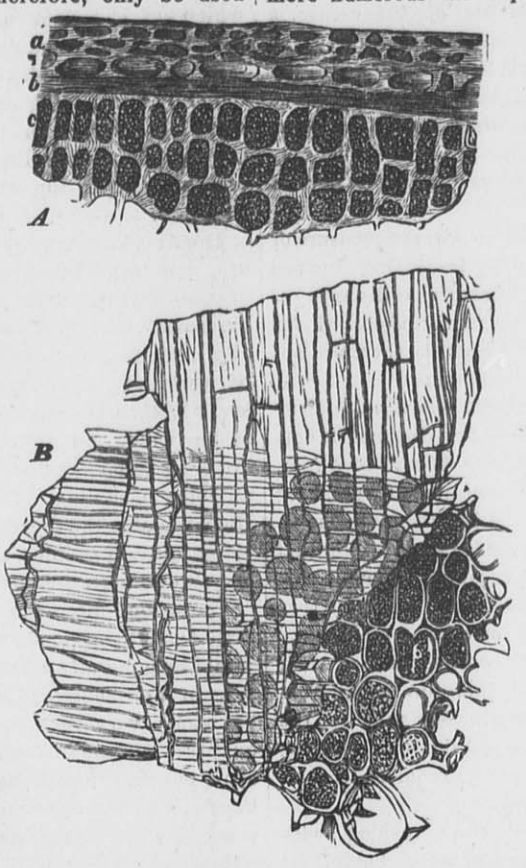

Fig. 26.—Outer covering of grain of barley. A, cross section; B, longitudinal section.—*a*, outer, *b*, middle, *c*, inner membranes. Magnified 220 times.

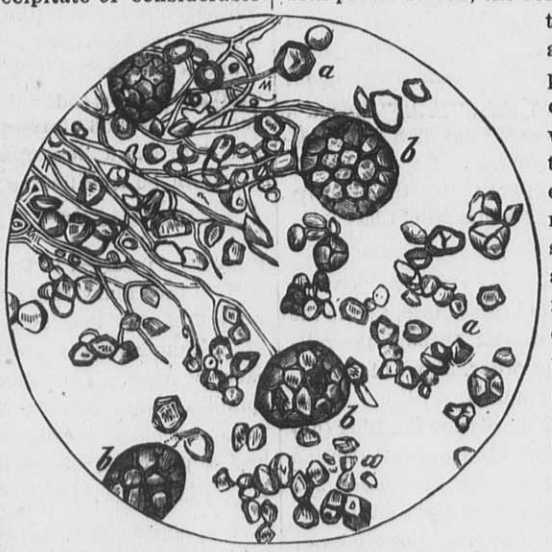

Fig. 27.—Starchy particles of oat-meal; *a*, separate particle; *bb*, a cluster of starchy particles; *c*, other cells.

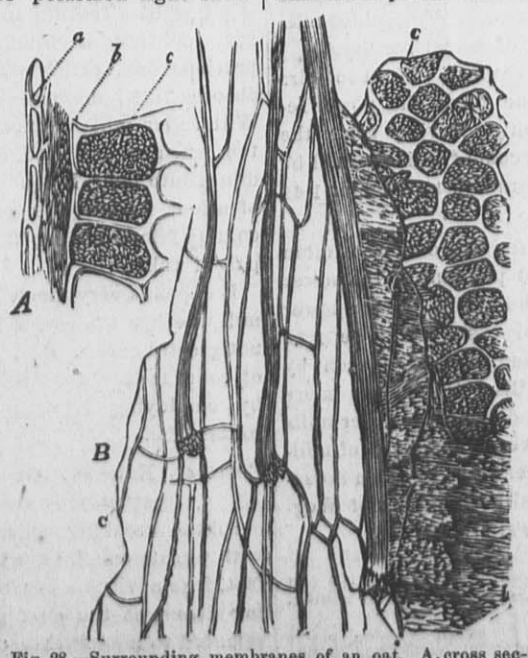

Fig. 28.—Surrounding membranes of an oat. A, cross section; B, longitudinal section; *aa*, outer, *bb*, middle, *cc*, inner membranes. Magnified 200 times.

[THE END]

Roller Mills.

EXPLANATION OF THEIR MANNER OF WORKING AND COMPARISON BETWEEN THEM AND MILLSTONES.

[*Translated by special permission from Professor Kick's Die Mehlfabrikation*].

[*Concluded from January number.*]

The novel systems of roller mills have all the adjustable roller pressed against the fixed roll by weights or springs, since Wegmann adopted this mode of applying the pressure, although it had long previously been recommended, and now and then it had been applied to malt crushing. By this means one of the rolls can, in case of need, yield, and the distance which the rollers are apart will be

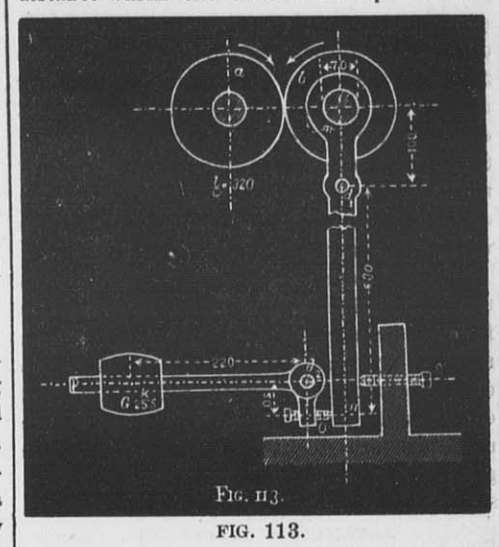

FIG. 113.

increased as soon as the resistance of the material being ground becomes greater than the pressure employed. By this arrangement the rolls are less liable to get damaged, particularly grooved rolls. Hard bodies that have chanced to get amongst the grain or middlings being ground will not easily hurt the rolls. The elastic pressure (by means of weights or springs) is constantly at work forcing the two rolls towards each other as long or as far as it is able to do so. An arrangement of this kind is shown by figure 113; *a* is the roller running in the fixed bearings, each end of the spindle of roller *b* has its bearings in a lever, *m*, *n* (movable round a pin, d^1). The lever *o*, *p* which can move on the shaft d^2, is caused by the weight *G*, acting on it at *o*, to press against the lever *n*, *m*, thereby forcing the roller *b* towards the roller *a*, as far as it is allowed to do so by the set screw *s*, which regulates the minimum distance to which the rolls can approach.

As long as the material being ground hinders the roller *b* from approaching *a* so near as it is allowed to do by the set screw *s*, it is pressing on the breaks, semolina or middlings being ground, with the full pressure brought to bear on it, and the bearings are also subjected to this pressure.

As soon as the lever *m n* touches the screw *s*, and both rolls are therefore the smallest distance apart, determined by *s*, the pressure exercised by the weight *G* is annulled by *s*, and the bearings will then only be subjected to the pressure which is caused by the resistance of the material being ground.*

As with grooved rolls, the action should be breaking, and not crushing; proper care must be taken that by means of the set screw *s* the right minimum distance is secured.

With grooved rolls the power of resistance by the material being ground will be smaller than with smooth rolls, the bearings will then only be subjected to this smaller pressure, and the power required to overcome friction will be very much smaller; *i. e.*, the capacity of the machine in proportion to the power consumed greater.

However, in cases where smooth rollers have to touch each other, as, for instance, when grinding fine middlings, the pressure should be taken as small as the case may allow by shifting the weight along the beam *p*, d^2 (the screw *s* being withdrawn). All unnecessary over-pressure should be avoided, because thereby more power is consumed or lost in overcoming the friction in the bearings.

If we now compare the *results from rollers with those from millstones*, we must come to the conclusion at once that the rollers do not cut the bran so much. This should not be understood to imply that with roller milling more broad bran is obtained than with millstones; on the contrary, more fine bran is now made than formerly, this being, according to a communication from Mr. Carl Haggenmacher, the

* Rollers of this kind can often be seen working for a long time without the moveableness of the one roller coming at all into action. Nor is the same at all necessary with an even feed free from hard substances. It is therefore quite erroneous to attribute a different action to the roller mills with pressure to the old roller mills, in which the rollers were held in a fixed position.

reason why the higher price formerly paid for fine bran fell and broad bran is now fetching more money. The cutting action of the grooved rolls cause the third and fourth breaks not to be as flat as those made by stones, but the grain fragments are rather more angular. Already in this stage of the process we find fewer large flakes of bran than is the case with stones. If the breaks are farther reduced to semolina, the coarse semolina to fine semolina, and so on, a good deal of the adhering bran is also broken, consequently there is finally much fine bran made. The bran broken in this manner is, however, altogether different to that splintered by the old method. There are not so many exceedingly fine bran particles rubbed off, which cannot be separated from the flour again. In the first and second breaks through grooved rollers there is frequently less than one-half per cent. flour made, besides a few per cents. of nice middlings, which come from the inner parts of the wheat kernel. On taking a handful of these breaks the fine particles adhering in the creases of the hand are much sharper than with breaks from stones.

If the fine middlings go on the smooth rolls the flour particles generally detach themselves from the bran, which is not torn, and can be removed by the purifiers, which follow the dressing machines. When rollers are used considerably more fine semolinas and pure middlings are made, and considerably more good flour than with stones.

SECTION II.—THE CAPACITY AND ECONOMICAL ADVANTAGES OF ROLLERS.

It has been previously remarked that the speed of the rollers is confined within certain limits by the heating of the bearings, which takes place when they are run at an excessive rate. The capacity of rollers can be increased in two manners: first, by increasing their speed, and then also by increasing the diameter of the rollers; the latter method has the advantage, that its adoption does not increase the friction in the bearings.

From the statement made by Otto Mueller, that in the flour mills of Hungary fitted with roller mills each indicated horse-power grinds 2.7 to 5.5 cwt. of wheat in 24 hours, while formerly, with millstones, 3.15 cwt. were ground on an average per day with each indicated horse-power, it is evident that, according to the plan adopted in the respective mills, the capacity of the mill is *diminished* as much as 14.3 per cent., or *increased* as much as 74.6, as compared with the quantity produced with the same power before the rollers were put in. This important difference in the various cases is caused by the great losses of power that can arise through friction in the bearings of the rolls.

However, supposing that the roller mills ground only 2.7 cwt. of wheat with each indicated horse-power, and that consequently 3.15 cwt. of wheat necessitated 1.17 indicated horse-power, the additional quantity of fuel that would be required would be at most $0.17 \times 24 \times 5.5 = 22\frac{1}{2}$ lbs of coal, which would be worth $1\frac{1}{2}$d. in Buda Pesth. But rollers make more of good quality flour. The profit made thus is estimated by Adolf Fischer to amount to 40 kreutzers (8d.) on each hundredweight of wheat.

There would consequently be a loss of $1\frac{1}{2}$d. as compared with a profit of 8d., consequently a net profit of $6\frac{1}{2}$d. per cwt. of wheat. In the same manner the profit would be found $8\frac{3}{4}$d. per cwt., if each indicated horse-hower is made to grind 5.5 cwt. of wheat.

According to a further statement of Adolf Fischer, the cost of coal for grinding 1 cwt. of wheat in Buda Pesth is 2d. to 2.1d. (calculating coal at 8d. per cwt.) This means burning 29 lbs. of coal for each cwt. of wheat, and taking one-horse power indicated as able to grind 3.15 cwt. of wheat, each horse-power indicated would require 92 lbs. of coal in 24 hours, or 3.84 lbs. per hour; a result which is possible with the splendid Woolf's steam engines, but must be put down as an excellent achievement. It will be noticed that the two statements agree perfectly, Otto Mueller, the engineer first named, builds the greatest part of the engines for the Buda-Pesth mills, while Adolf Fischer is the best known milling engineer in Buda-Pesth.

The capacity of a roller mill (Wegmann's system as made by Ganz & Co.) with two pairs of grooved rollers 13 in. long, $8\frac{1}{2}$ inches diameter, and running at 200 revolutions per minute, is stated at 100 to 140 cwt. of semolina reduced to a somewhat finer degree in 24 hours with two horse-power. This is, however, generally not under four horse-power, as a great part of the power consumed is lost in overcoming the friction in bearings.

The following theoretical observations are here given, as allowing some insight in the economy effected by working with rollers;

For *splitting* a kernel of soft Hungarian wheat into two parts, each of half the length of the kernel, a knife must be pressed down with a pressure of $4\frac{1}{2}$ to $5\frac{1}{2}$ lbs., and in order to split it in the direction of the crease, a pressure of $5\frac{1}{2}$ to $7\frac{1}{4}$ lbs. is necessary. The distance through which this pressure, steadily growing from 0, acts, can be put down as 0.0025 of a foot, and consequently the force absorbed for crushing a grain of wheat may be approximately stated as 0.00724 foot pounds (0.001 mk).*

For *shearing* a kernel of wheat a pressure of about 19.86 lbs. (gradually increasing from 0) is required, acting through a distance of 0.0017 of a foot. The power absorbed for shearing a grain of wheat is therefore approximately 0.016881 foot pounds.

For *crushing* a kernel of wheat up to 22.07 lbs. pressure is required, the distance it acts through is one milimeter or 0.00328 of a foot, consequently the power consumed for crushing a kernel until it splits is 0.036,166 foot pounds.

These approximate average figures show that the power required for crushing is double that necessitated for shearing, and this in its turn is double that sufficing for cutting the wheat.

The grooved rolls, in consequence of their shearing action, should therefore require but half the power that smooth rolls take for the work of reduction pure and simple, not taking into consideration the power required to overcome friction in the bearings.

The power required for crushing with smooth rolls is calculated in about the following manner: If the kernels of wheat are, on an average, $\frac{1}{4}$ in. long, and 15 kernels, laid close together with their thin sides touching, occupy 2 in.; if, further, it be supposed that between each kernel and the next there is a distance equal to the diameter of the kernel, there would be 50 kernels to a length of roller of 13 in., and if the diameter of the roller be 8.66 in. (220 mm.), and the circumference consequently 27 in., the number of kernels that can be reckoned for one revolution of the roller would be 50 times

$$\frac{27}{2 \times 0.25}$$

(50 times the circumference of the roll divided by twice the length of a kernel of wheat), i. e., about 2,700 kernels, which would weigh about 0.0243 lbs. The power required for crushing these 2,700 kernels would be 2700 x 0.036 foot pounds or $97\frac{3}{4}$ foot pounds. As the rollers run at 200 revolutions per minute, the quantity of wheat cracked in 24 hours would be

$$0.0243 \times 200 \times 60 \times 24 = 7000 \text{ lbs.}$$
$$(0.011 \text{ ko} \times \tfrac{200}{60} \times 60 \times 24 = 3{,}196 \text{ kilos})$$

If the wheat were fed in so close, that in the direction in which it passed through the rolls one kernel touches the other, about 14,000 lbs. (6,400 kos) would be cracked.

The power required purely for crushing (not reckoning power required to overcome friction in bearings) would be, in the first ease, 200 times 97.75 foot pounds = 19,550 foot pounds per minute, or 0.6 horse power; in the latter case 39,100 foot pounds per minute, or 1.2 horse-power.

The pressure in these experiments has been applied slowly increasing, and the figures found as resisting power of the kernel inserted in above calculations accordingly. The resistance, would, however, be somewhat larger, when the reduction is more rapid.

In order to crush a kernel of wheat with a blow, a force of about 0.0434 foot pounds is necessary (i. e., 20 per cent more than has been provided for in above calculations), and consequently 0.72 horse-power, instead of 0.6 horse-power, will be required by a pair of rolls for crushing 7,000 lbs. of wheat per day.†

If the feed is twice as close, or for two pairs of rolls with the same feed, the power required for crushing only, leaving aside the power required to overcome friction, would be of course twice the figure just stated, or 1.44 horse-power.

The power required for overcoming friction is often put down as 50 per cent of the power actually doing work, and at this rate the power required in the second case would be 2.12 horse-power, and is often stated as such by the makers of roller mills. Others are more conscientious, and put down three roller mills as taking the same power as two pairs of millstones. This would mean five to seven horse-power for each roller mill of the size of Wegmann's, Haggenmacher's, etc.

*One horse-power indicated is equal to 33,000 foot pounds, i. e., it will raise 33,000 lbs. one foot in a minute.

†A kernel of wheat was laid between two steel plates and a half pound weight dropped on same from diverse heights, until the crushing was effected. On an average, a height of one inch (25 m.m.) was found necessary for the white wheat used, thus giving the above figure.

As it is necessary with *grooved* rollers, in order to do the work correctly, that the feed runs on the rolls in a single stream, and as the power required for shearing the particles decreases as they get smaller, it follows that—

1. With the same power, grooved rolls, which act shearing, can be run faster as the particles fed to them decrease in size.

2. That the capacity of a roller mill can be found by multiplying the weight of the breaks, middlings, etc., covering a unit of space with the surface of the roller (measured in the same unit) and this by the number of revolutions in 24 hours.

The first inference can be put to practical use, only to a limited extent, in consequence of the heating of the bearings, which would otherwise result, and only in cases where certain machines are continually doing one kind of work only, i. e., with unintermitting grinding. With the latter system of grinding a miller would be unjustified in running the breaking rollers at the same speed as the rolls reducing semolina. The one should have almost double the speed of the other; this being quite feasible, as grooved rolls do not necessitate high pressure.

The second inference does not allow of any statements being made as to quantity, which would be generally correct, because the quantities of intermediate products made from a cwt. of wheat vary very much, according to its quality; and the distances which the rolls are apart in order to make the first breaks, second breaks, etc., but do not remain unalterable, but must also be determined by the quality of the wheat.

SECTION II.—THE CAPACITY AND ECONOMICAL ADVANTAGES OF ROLLERS.

A close observation of the power required to overcome friction in the bearings is of great importance, as it is so much power lost. The loss can be expressed, for a pair of rollers having four bearings, by the following equation:—

$$L = 4\,e\,\frac{P\ 3.14\ d\ n}{33000} \text{ horse power.}$$

P expressing the pressure to which one bearing is subjected, d the diameter of the bearing, n the number of revolutions of the roll per minute, and e the equivalent of friction between the two materials of which the roller spindles and the bushes are composed. The equivalent or co efficient of friction, e, can be put down as 0.06 of the pressure applied, with well lubricated bearings. The equation can therefore be modified as follows:

$$L = \frac{4 \times 0.06 \times 3.14\ P\ d\ n}{33000} \text{ or } \frac{0.7536\ P\ d\ n}{33000} \text{ horse power.}$$

P must be inserted in lbs., d in feet.

With the Henry Haggenmacher roller mill a weight of $56\frac{1}{4}$ lbs, acts with a leverage of 27.72, thus giving a pressure of 1,560 lbs, to each bearing. The diameter of the roller spindles being, moreover, 0.23 of a foot, and the speed n=135 revolutions per minute, the loss of power in this instance will be

$$L = \frac{0.7536 \times 1560 \times 0.23 \times 135}{33000} \text{ or } \frac{35503}{33000} \text{ or } 1.1 \text{ horse power.}$$

Consequently for the two pairs of rolls the loss is 2.2 horse power.

It may, however, very easily happen that the friction in the bearings becomes double, if the bearings are not carefully treated, or the speed is increased; in the latter case, however, the capacity would be increased also. Supposing the equivalent or co-efficient of friction is the same, but the speed increased to 200, the power required to overcome the friction in the roller mill with two pairs of rolls would be 3.2 horse power.

With the Wegmann-Ganz's small roller mill, P amounts to 640 lbs., the diameter of shaft d is 0.18 of a foot ($2\frac{1}{8}$ inches), the speed n= 200, and the machine, which is, like the previous one, fitted with two pairs of rolls, absorbs 1.23 horse power to overcome friction. With roller mills of more powerful construction, such as are used for grinding fine middlings into flour, P equals 3,360 lbs., d= 0.328 of a foot, n=200, the power required for overcoming friction being 3 horse power for one pair of rollers.

It depends very much on the foreman of a mill whether the power lost by friction does not greatly exceed this, and the constructors of roller mills must strive to lessen this defect by employing friction rolls, bearings with rollers, &c.

CRITICAL REMARKS ON THE USE AND CONSTRUCTION OF ROLLERS.

All the breaking rollers may only be used with wheats which have been well cleaned; in fact, it is advisable to treat the wheat on ending stones, as the dust particles are thereby removed to a great extent from the crease. After being ended, the wheat should pass through a cylinder where it is sifted, and then an aspirator. Wheat thus prepared, will give, on good wheat-breaking machines, flour that is saleable, although common in quality, as the small percentage of flour made in the first stage of the high grinding process is always of inferior color, and what is still more important, a very small quantity only is made with the above machines. With Zipser's wheat-cutting machine, for instance, not more than 1 to $1\frac{1}{2}$ per cent of flour and middlings are made when breaking the wheat kernel into several parts. The wheat is cut in these excellent machines by passing through two adjustable rolls (the bearings of which are rigid); these rolls consist of circular steel discs, indented similar to saws, with a cast iron disc of smaller diameter between each of the steel discs and the next; or they consist of cast iron rollers, into which toothed steel strips are let in. Two discs and one interval in one roll, and one disc and two intervals of the other roll, go to the length of one wheat kernel, and consequently the whole kernel, or a kernel which has already been split once in the direction of the crease is divided into three parts, crosswise. Power required $1\frac{1}{4}$ h. p., capacity 600 cwt in 24 hours, the length of roller being $12\frac{1}{3}$ inches.

With all roller mills care should be taken to have the feed adjusted so as to be perfectly uniform; the speed or grooved rollers should be the same or larger than that with which the wheat falls on them;* and the quantity of the feed must not be crowded, or else more flour and middlings will be made by the breaking rollers than is desirable. It is superfluous having an elastic pressure applied to these rolls by means of weights or springs, because the rolls always have to be apart a certain distance, and stones or pieces of iron so large as to force these rolls further apart can be easily taken out by sieves; they, moreover, are nearly always a consequence of careless wheat cleaning. The elastic pressure which is often used is, however, perfectly harmless.

When cracking wheat with smooth rollers, the kernels, if they are of a soft kind, and the pressure applied is small will be broken in the direction of the crease only, and the two halves may often be seen still adhering to each other at the backside of the kernel, like an open book; hard wheats treated in the same manner would be regularly broken in various parts. If the rollers are put closer, soft wheats will be pressed flat, and any semolina made is very pure or free from bran; hard wheats will be reduced to a considerable extent, and the semolinas made from them will not be so good as from the first kind. However, they would be better than those made by stones, and there is also a much larger quantity from them than there would be from soft wheats.

Speaking of roller mills in general, it is certain that everything depends on the correct manner of using the machine. Every roller mill can be made to work badly, and the difference in the products from the same make of roller mills in different mills is just as great as it used to be formerly with millstones. Just as was the case then, the endeavor must be to make a uniform product. This condition can be attained:

(1.) By having *the feed correctly adjusted and the arrangement of good construction*, so that a uniform, not overthick, stream of middlings goes between the rollers.

(2.) By having the *rollers perfectly parallel* to each other. This condition makes it necessary for a miller to investigate accurately (with rollers having an arrangement to put the rolls at a minimal distance from each other) whether the setscrews act uniformly on both sides of the roll. The simplest way of testing the rolls for accuracy in this respect will be by inserting a piece of steel sheet, first in centre between the rolls and then at the right and left extremity; an assortment of various guages of these plates would be required. If, as is the case with roller mills for grinding middlings, the machine is not supplied with an arrangement for regulating the minimal distance which the rolls are to be apart, the rolls would have to be in contact along a straight line, and they can also be tested as to this by a thin sheet of metal which it should be impossible to thrust between them. It is necessary that the rollers are lying perfectly horizontal in their frame. This can be attained by wedging up the bed-plate of the machine, provided the rolls are perfectly parallel with each other.

(3.) The rollers must be of accurate cylin-

*The speed at the circumfereace of the rolls would be about 83 inches. The speed for a fall of 10 inches about 86 inches per second, the condition is therefore complied with because the resistance of the air would retard the speed. It would be seen from this, that the speed of the rolls of 8 inches diameter should be somewhat higher than that calculated for, viz, 200.

drical shape, and their axis of rotation must also be the geometrical axis of the surface, that is they must run smooth. If the rollers are tested as to the second condition, by slowly turning the driving pulley, and found correct in all these positions, they would then be correct as regards the third condition also.

(4.) If the rolls are provided with automatic pressure arrangement, the pressure must be perfectly equal on both ends of the roll.

It is easy to see that equal pressure is put on both ends of a roller, when the pressure is given off, by means of levers and weights, by simply checking the position of the weights, or, if necessary, also the dimensions of the levers; but it is much more difficult to do this when the pressure is applied by springs, because the springs are liable to change in degree of elasticity. The safest test is always to examine the ground material. This mode will, however, suffice only, if the former conditions have been complied with.

Great attention should be given to the bearings with every roller mill. The wear of the bearings can be greatly decreased by avoiding all superfluous pressure. A good foreman miller, who is a careful observer, would find out in a very short time the exact amount of pressure required for the various kinds of work which the roller mills have to do in the system employed. For breaking rollers, or rollers for reducing coarse semolina into a finer number of semolina (in fact, in cases where the rollers would be fitted with an arrangement determining the minimal distance to which they can approach each other) an excess of pressure would not have any material consequences, because it would scarcely ever come into action, but is counteracted by the set screws, wedges, etc. In cases where this arrangement is not provided, as for instance, when grinding fine middlings, no greater amount of pressure should be applied than is absolutely necessary, because, besides the greater wear of bearings, excessive pressure would consume very often a very large amount of power, without adequate increase in the work done.

The lazy habit, according to which the pressure on the rollers is seldom altered, and by which it is endeavored to attain the same end by increasing or diminishing the feed, should be allowed only within the limits which are found permissible by experience.

The roller mills should not be made to reduce to too great an extent at the time; "breaks or semolinas should not be crushed too much in one operation" because the bran would in that case burst, which should be avoided. It must be further stated that it is quite a mistake when some parties state that the surface of the roller mills should not be rough, and when chilled iron rollers show this defect they are to be polished up with emery cloth. On the contrary, a uniform fine degree of roughness will incrrase the capacity of the rolls, if the latter are run with differential speed, and the pressure required will also be less in this case.

Scrapers are fitted to most of the smooth rolls, and attention should be paid, that they scrape perfectly clean, so that no middlings dhere to the rollers,

As regards the construction of roller mills, innumerable systems have been introduced of late; Wegmann, the originator of the roller movement, has taken part in same by constructing several different machines which, although resembling each other, are each an improvement on the previous make.

The *equal speed* of the rollers, which Director Steiger, in Fiume, according to a statement of Ad. Fischer, considered particularly adapted for producing specially fine flour, even before Wegmann stated it to be so, was at first adopted by the latter in his machines, and he used porcelain rollers made as smooth as possible to keep the bran intact as much as possible. Other makers followed this example; roller mills were made, having rolls as smooth as possible, these were driven partly with equal speed. The pressure required was consequently very great, and the power lost in overcoming friction in the bearings in proportion. Soon, however, it was found that the differential speed formerly employed, increased the capacity, and particularly reduced the power required, and makers reverted to it, at first only timidly, and Wegmann has now also applied it to his machines.

From each roller mill should be required: powerful construction in general and careful work in respect of the roller and their bearings. All parts should be easy of access, the regulation should be easy and good, as also the adjustment of the abjustable roll, the pressure should be automatic and the minimal distance of the rolls should be easy to change.

It is not objectionable to use roller mills in which the feed passes through rolls, twice or three times in succession; but the adjustment is more difficult with them, and particularly for breaking wheat or reducing semolina roller mills with separate feed passages are preferable, because the products will be better purified. When grinding fine middlings, rolls crushing twice in succession will lead to a quicker conversion into flour.

For large mills, it is advisable to break the wheat by breaking rolls of wheat cutting machines; to reduce the semolinas by reducing rolls, and to finish with smooth rolls; stones would be used for ending the wheat and grinding the bran.

For eight to twelve run mills it would not be advisable to use rollers for grinding middlings, unless the mill is new furnished; breaking rollers as above; the reducing rollers should be very finely grooved or smooth; ending and bran grinding as above.

In small mills, rollers of one kind only would be advisable besides the millstone, viz, rollers for reducing the semolina into fine middlings (at most a roller mill for breaking the wheat would be used in addition), one pair of the rolls in same being grooved finer than the other. Smooth rollers can also be used in this case for breaking the wheat although they are not so advantageous as grooved rolls.

In low grinding, smooth rollers are sometimes used for crushing the wheat preliminary to passing it on the stones.

It should be remarked here that the friction in the neck-and-step brasses of a millstone is less than the friction in the bearings of a rollermill, and the power thus lost in not counter-balanced by the smaller amount of power taken in the reduction proper. However advantageous, therefore, rollers may be, it would still be foolish to discard the millstones altogether. For ending wheat and grinding bran, they can hardly be missed, and for grinding "Auszugdunst" (middlings that have been purified many times and are perfectly pure) they would take less power than rolls, but would not give quite so good a color. From a mechanical point of view the millstone is a very perfect machine, and it will never be entirely superseded by rollers.

Millers' International Exhibition.

Following is the code of regulations for the test trials of automatic cut-off steam engines at the Millers' International Exhibition, Cincinnati, June, 1880.

THE ENGINES.

All engines entered for trial will be uniformly 18 inches diameter of cylinder and worked at 600 feet piston speed. The drop cut-off engine should be 18x48 inches (unless the builder prefers a longer or shorter stroke), and worked at 75 revolutions per minute.

The pulley fly wheel for drop cut-off engines should be 16 feet diameter and 25x26 inch face, or adapted to a 24 inch belt. Should any builder prefer to use a smaller wheel, not less than 14 feet diameter, he may do so by promptly advising the expert of the size wheel he will use. But in each instance, if possible, a 16-foot wheel should be used. Engines having other than 48-inch stroke will make diameter of fly wheel equivalent in diameter to 16-foot wheel at 75 revolutions per minute.

Each cylinder shall be drilled and tapped by the builder for indicator connections. This will be for ½-inch pipe. The centre of holes (one at each end of cylinder) shall be opposite centre line of cylinder. and centre of width (or length) of cylinder clearance space. Each cross head shall be drilled and tapped ⅜-inch (machine thread), 1 inch deep for attachment of indicater driver. This hole shall be opposite center of cross-head pin.

Each cylinder shall be drilled and plugged at both ends, for taking the clearance of cylinder and steam passages. The upper holes must be so situated as to permit the filling of spaces with water to the highest point, and the lower holes must be so situated as to completely drain the spaces after they are filled. The holes should be for the reception of ⅜-inch pipe. The clearances will be measured previous to the trials with cylinders hot.

Each competitor will be allotted a space 20 feet wide and 35 feet long, in which he will built his foundation under the direction of the expert.

Each competitor will be required to furnish his connection with the main steam pipe, with the main injection pipe, and with the main overflow pipe.

Steam will be furnished the engines one week previous to the opening of the exposition for the purpose of testing steam joints, adjustment of valve motion bearings and regulations.

All steam joints, piston packing and valve joints must be practically steam tight before the engine is submitted to the trials. The fit of piston packing will be determined by removing back cylinder head, setting crank on forward and back centres and subjecting pistons to steam pressure at ninety pounds by guage.

It is expected that all pistons will be steam tight under this test.

Each engine must be furnished with complete condensing apparatus, including a bye pass valve to change from condensing to non-condensing engines.

Each competitor will file with the expert a summary showing the

Diameter of cylinder to nearest .01 inch.
Stroke of piston to nearest .01 inch.
Diameter of piston rod to nearest .01 inch.
Diameter of steam pipe.
Diameter of exhaust pipe.
Area of steam ports, each.
Area of exhaust ports, each.
Diameter of fly wheel.
Face of fly wheel.
Weight of fly wheel.
Weight of engine exclusive of fly wheel.
Diameter of injection pipe.
Diameter of overflow pipe.
Diameter of air pump.
Stroke of air pump.
Manner of working air pump, and any special points of merit possessed by the engine.

THE TEST TRIALS.

The boilers furnishing steam for the trials (two in number) are each of the following dimensions:

Diameter of shell	48 inches.
Length of shell	16 feet.
Tubes	32—4 inch.
Heating surface shell	114.89
Heating surface tubes	536.16
Heating surface heads	12.56
Heating surface total	327.24 sup. fect.
Grate surface total	3 .32 sup. feet.
Heating to grate surface, ratio	37.58
Grate surface to calorimeter, ratio	6.327

and are calculated to furnish 4,500 pounds of steam per hour at 90—100 pounds pressure by gauge. The safety valves will be set to blow at ten pounds above the mean pressure carried, and care will be taken to prevent a blow during trial.

The water delivered to the boilers will be drawn from the city mains into the receiving tank set on a platform scale. From this it will be drawn into a supplemental tank set below. From the supplemental tank the water will be delivered to an independent boiler feeder connected with check valve of boilers. The steam required to drive the boiler feeder will be taken from a duplicate battery of boilers set alongside those furnishing steam to the engines under trial. The water fed to boilers will be determined in weight whilst in the receiving tank.

The quality of steam will be taken in the pipe leading from the main pipe to the engine by a continuous calorimeter with entry pipe set opposite to the direction of flow in the center of steam pipe.

The condensing water will be obtained from the Miami canal in the rear of Exposition buildings by natural lift, and the overflow from hot well will be returned to the canal by natural flow.

The overflow from the hot well will be measured in transit to the canal to determine the weight of water expended in effecting the vacuum. The water weighed to the boilers (assuming saturated steam) will represent the condensation by work, and condensing water; and the difference between the weight of water measured and the quantity weighed to the boilers will represent the weight of condensing water required to produce observed vacuum in the condenser.

The steam pressure in the pipe leading to the engine will be fixed at ninety pounds, and will be taken by gauge with entry pipe set opposite to the direction of flow in center steam pipe.

The vacuum will be taken by spring gauge in the condenser.

The temperature of overflow will be taken in the hot well.

The diagrams from the cylinder will be taken with Thompson indicators. The diagram will be read for initial pressure, for cut-off, for pressure at cut-off, for terminal pressure, for release, for counter pressure, for exhaust closure, for compression pressure, and for mean effective pressure. From the diagram will be deduced the maintenance of steam pressure to cut-off, the relation of actual to theoretical expansion, the relation of actual to calculated ratio of expansion, the steam accounted for, and the relation of vacuum in the condenser to vacuum in the cylinder. But the economy of engine will be calculated from the known weight of steam delivered to the pipe.

The revolutions of engines will be taken by continuous counter.

The temperature of injection and water in hot well will be taken with Green thermometers.

An aneroid barometer will be used.

The resistance will be obtained by a large rotary pump driven by two twelve-inch belts from test trial line shaft. The load will be regulated by throttling the discharge orifice.

The indicated load for engine non-condensing will be fixed at 160 horse-power, or less; and the indicated load for engine condensing will be fixed at 220 horse-power, or less. The loads condensing and non-condensing will be alike for all engines and maintained as uniformly as possible for each trial.

The time will be taken from a chronometer clock.

The signals for observation will be rung on the gong regularly every fifteen minutes,—two taps of the gong will call the attention of assistants to an approaching observation, and one tap following will indicate the termination of a fifteen-minute interval.

Previous to the trial all pipe connections from all but the engine under trial will be closed by blank flanges.

The duration of trials will be fixed at ten hours for engine condensing, and at ten hours for engine non-condensing. Previous to the commencement of each trial, condensing and non-condensing, the boilers will be steamed up to the pressure necessary to maintain ninety pounds by gauge in the pipe at engine under trial; and the height of water in the boilers brought to working gauge point, all water supplied to the boilers thereafter will be weighed and charged to the engine, subject to correction by calorimeter data. At close of each trial the water level and steam pressure will coincide with conditions at commencement of trial.

During condensing and non-condensing trials the engine will work with stop valve set entirely open.

At close of second trial on each engine the main belt will be removed, and engine operated for thirty minutes without load other than its own friction, for friction diagrams. The counter will be read regularly every minute during this trial.

The economy of engine will be deduced from the net weight of steam supplied during the trial; no notice will be taken of the coal actually burned in producing the steam, the boilers being worked simply to supply the required quantity of steam in best thermal condition and at uniform or constant pressure; and the cost of the power per indicated, and per gross load, horse-power per hour, will be stated upon an evaporation equivalent to ten pounds of steam per pound of coal.

The steam gauges, vacuum gauges, engine counters and steam engine indicators used in the trials will be furnished by the American Steam Gauge Company, Boston, Mass.

[Signed] JOHN W. HILL,
Chief of Experts.

Approved:

GEO. E. GAULT, Pres. Board Coms.
E. H. HUNTINGTON, Treas. Board Coms.
JAS. H. SNODGRASS, Sec'y Board Coms.
} Executive Committee.

THE LAW OF LEAP YEAR.—The Albany *Law Journal* calls attention to an important law relating to the extra day in leap year, which business men and others should bear in mind. The *Journal* says: As leap year is here, it is well to know what the law of leap year is. The law, it is said, takes no notice of parts of days, and, as to the 29th of February, it takes no notice of the whole day. The 28th and 29th are computed as one day. For example: suppose a note is dated on the 28th of February, 1880, payable one day from date. Ordinarily it would be payable on the 4th of March, and so it is in leap year, and not on the 3d. In Indiana the question has recently come before the Supreme Court, in respect to service of process in 1876, the last leap year. The law there requires ten days' previous service for the entry of judgment. In the case before the court the judgment was premature if the 28th and 29th of February were to be computed as one day. The court said: 'It must be regarded as settled in this State that the 28th and 29th days of February in every bisextile year must be computed and considered in law as one day.'

"The question is set at rest by our statute, 1 R. S., m. p. 610, s. 3, which provides that 'the added day of a leap year and the day immediately preceding, if they shall occur in any period so to be computed, shall be reckoned together as one day.' This embraces statutes, deeds, verbal or written contracts, and all public or private instruments.

The wheat crop prospects in South America are reported good.

Fast Railway Speeds.

The speed of railroad trains in France, Germany and the United States is still below that of several lines in England. The "lightning train" on the Paris-Marseilles line makes the distance of 539 miles between these two cities in 15 hours ad 21 minutes, the average speed, including stoppages, being 35 miles an hour. The express train on the Lehrter Railway runs from Berlin to Cologne at the rate of 37½ miles an hour, including stops, making the entire distance of 304 miles in 9 hours and 26 minutes. The Scottish mail leaves Euston Square at 8.50 in the evening and reaches Edinburgh at 6.45 the next morning. The distance is 401 miles, the time 9 hours and 55 minutes, the rate of speed, including stops, 41½ miles an hour. The express from King's Cross runs to Edinburgh, a distance of 397 miles in 9½ hours, or at the rate of 42 miles an hour, including stops. The fast train from Paddington to Plymouth, and the Irish mail from London to Holyhead, average between 41 and 42 miles an hour, or about the same as the Scottish trains. The fastest short-distance trains in Germany are that which runs from Spandau to Stendal. 57½ miles, without stopping, in 1 hour and 17 minutes, or at the rate of 45 miles an hour, and the express, which makes the distance of 88¾ miles, between Berlin and Madgeburg, in 2 hours and 7 minutes, or at the rate of 42 miles an hour, including two stops. In England a much higher rate of speed is attained on short distances. The Great Western trains run through from London to Swindon at the rate of 53 miles an hour, making the entire distance of 77¼ miles in 1 hour and 27 minutes, while nearly 50 miles an hour is made by the special express, which runs from London to Wantham, 105 miles, in 2 hours and 5 minutes. This is doubtless a much higher rate of speed than the usual schedule time on roads in the United States. The Washington limited express leaves New York at 10 A. M. and reaches Washington at 4 P. M. The distance, 230 miles, is made in 6 hours, or at the rate of 38¾ miles an hour, including stops. Between New York and Philadelphia but two stops are made, the rate of speed is 40 miles an hour. The Boston express, which leaves New York at 12 A.M., runs to Boston, 233 miles, in 7 hours and 11 minutes, which is about 22 miles an hour, including the six stops that are made. The special mail and express train on the New York Central and Hudson River road makes the distance at night between New York and Albany, 143 miles, in 4 hours and 5 minutes, or nearly 36 miles an hour. Only one stop is made. The Cincinnati express on the Pennsylvania Railroad leaves New York at 6 in the evening and reaches Pittsburg, a distance of 444 miles, at 8.30 on the following morning, and Cincinnati, 757 miles, at 8 P. M. of the same day. The rate of speed, including stops, is about 30 miles an hour between New York and Pittsburg, and 29 miles an hour between New York and Cincinnati. The distance between Harrisburg and Pittsburg, 249 miles, is run in 7 hours and 35 minutes, with three stops, or about 33 miles an hour. The fast line to Chicago by way of the Pennsylvania Road leaves New York at 9 A. M., and reaches Chicago at 7.20 on the following evening. The distance is 912 miles, the time 34 hours and 20 minutes, the rate of speed less than 27 miles an hour.—*Scientific American.*

The Roller Controversy.

The suit of R. L. Downton vs. the Yaeger Milling Company, after several delays and postponements, was brought up in the United States Circuit Court, before Judge Treat, for reargument, on Jan. 10th. In our issue of March 22, 1879, we gave a statement of the case, both for complainant and for defendant, and deem it unnecessary to repeat it here, except to state that the suit is brought for alleged infringement upon a patent roller, used for crushing the coarse middlings so as to remove the germ of the grain. The plaintiff asks for $50,000 damages and an injunction. In March last, the case was first argued as to the ownership of the patent, before Judges Dillon and Treat, and a decision was given in favor of the plaintiff. Then an argument was had before Judge Treat as to the validity of the patent. No decision was rendered, but the case was ordered for rehearing, and it came up before Judge Treat in that shape as previously intimated. The plaintiff is represented by Mr. George Harding of Philadelphia, and Messrs. W. G. Rainey and J. M. McDougall, of this city; and the defense by Mr. Cotzhausen, of Milwaukee, and Mr. G. M. Stewart, of St. Louis. Mr. Rainey made the opening argument for the complainant Saturday, and was followed on Monday by Mr. Cotzhausen, for defendant. Mr. Harding spoke Tuesday afternoon, closing the case. Judge Treat announced that he would give a decision at an early day — probably on next Monday. Having heard the case before. there were but two points for him to consider—I. As to the sufficiency of the specifications. and, 2, as to the prior use of the patent.—*St. Louis Miller of January* 17.

Oceans in Danger.

A CHICAGO MAN WHO HAS FOUND OUT HOW TO SET THE RIVER ON FIRE.

A Chicago man is about to astonish the world. More than that, he claims to have revolutionized philosophy, discovering truths which completely ovverthrow many of the commonly accepted theories upon which are based alleged laws of nature. More than that, these new discoveries will, if practicable in their operations, convulse gas companies with fright, demoralize coal companies, and disgust nature with her efforts at growing trees for fuel.

The gentleman's name is A. D. Woodman, and he resides in the West Division. He appears to be a thoroughly educated man, is a chemist and machinist, and has been for years an experimenter in matters looking to new sources of light and heat. In the course of his investigations he became satisfied that certain claims of natural philosophers as to the material basis of natural laws were all wrong He put himself to work in an exactly opposite direction, disregarding certain accepted tenets of scientific men, picked up rejected ideas, worked out his own theories as to creative powers, and after years of experiment, study and poverty, is prepared to demonstrate by exhibition, that water can be utilized for heat and light. His machine is composed of over thirty pieces. In that machine he disintegrates water, and bringing its component parts together again, produces light, heat or steam, as he chooses. The light produced is a beautiful and very brilliant flame, and can be perfectly controlled. Its heat is of the most intense character. By the turn of a valve he can transform the light into steam. The process by which this is accomplished is a secret. The discoverer admits that he generates a tremendous explosive power—a power as great as that claimed for the Keely motor; but he utilizes it at once in the manner mentioned.

Mr. Woodman knocks philosophy all to pieces, denying many of its most important laws. As a result of his discovery he declares that the electric light is not needed either for brilliancy of illumination or for economy, because his burning water will supersede it. As a motor power, he thinks he can make a locomotive boiler of sixteen cubic feet capacity that will draw to New York city a train of cars of any length. If these claims can be substantiated, then Mr. Woodman will render any further study of the electric light by Mr. Edison entirely unnecessary. With the chain of the great lakes to draw upon for material, Chicago ought, should Mr. Woodman's discovery be of use, to be the best lighted city in the world. A large generator is now being prepared, in order to make a thoroughly practical test of the discovery.—*Chicago News.*

BLACK HILLS PRODUCE.—In the East, when a farming district produces a crop of wheat, it is considered as so much wealth, which enriches themselves and the country at large. But very few realize that the Black Hills are contributing to the wealth of the world at the rate of $425,000 per month, clear gold dug out of the ground, It is true that most of this, in the shape of bullion, is shipped from the country. But $200,000 at least is paid out every month for expenses and labor. This amount is circulated among us and gradually finds its way to the solid improvement of the country. From the most reliable information, gleaned from our bankers and mine-owners, we find that the production of gold taken out of the Black Hills during the year 1879, will not fall short of $5,000,000.

AMONG other prophesies based on astrological deductions, Zadkiel's Almanac for 1880 predicts that in March "the President will find ample scope for the exercise of all his moderation, wisdom, and patience, for politics will be very lively and embittered in America, and United States soldiers will have to take the war-path." "The square of Mars and Saturn" will cause feverish excitement in New York in May, and "the marshaling of troops will rouse the martial instincts of the American people." In the Old World the outlook is no brighter, the happenings or things likely to happen during the coming year being rather dismal all around.

COLORADO'S PROSPERITY.—Statistics published Jan. 1st, show that 1879 has been the most prosperous year of Colorado's history—the failures fewer and the amounts less. Within six months 1,500 new dealers have opened up different branches of trade. The farmers had an unusually fine season, and are in easy financial condition, as are all other interests in the State. City merchants have received much patronage that has heretofore gone East. New towns are springing up in every direction, and all are prospering. Business in the city shows an increase of fully one-third over 1878. Real estate valued at $2,700,000 has been transferred, over 400 brick and stone buildings erected, and one hotel, costing $500,000. Cattle shipments from the State were 128,000 head; wool product, 7,000,000 pounds; wheat, 2,250,000 bushels, and other grain in proportion. Railroads and telegraphs have been extending their lines rapidly. The total mine production was $19,110,862, against $9,820,743 in 1878. Lake County alone increases nearly nine millions. In Leadville the total amount of ores treated was 110,484 tons, realizing $10,504,106, or $95 per ton in pure silver and metallic lead—the greatest production ever known in any camp of its age in the history of silver mining. The average during the year has been a little over 335 tons, worth $9,373 per ton.

THE Searcher department of the New York post-office, in the space of one month, gathered from the mail-bags the following curious and heterogeneous collection of unmailable matter: Received alive.—Rattle snakes, black snakes, copperhead snakes, moccasin snakes, cats, grasshoppers, bees, hornets, wasps, aligators, canary birds, potato bugs, horned frogs, tortoise turtles. Received dead.—Mice, butterflies, humming birds, rats, insects, squirrels, quails, bugs, pheasant. Cooked articles.—Plum pudding, boiled quail, ham sandwiches, bread and butter, cake, crackers, bread pudding, jelly, custard, cheese, sausages. Miscellaneous.—Pistols, loaded cartridges, torpedoes, medicines, glassware, clothing, soiled undergarments, baby clothes, hosiery, hair brushes, combs, carpenter tools, pieces of machinery, fence wire, gold and silver watches, jewelry, notions, and novelties of all kinds; shrubs, roots, scions, herbs, fresh and dried; fruits and flowers, and last but far from least, six cases of dynamite, which were promptly thrown into East River.

THE Chief of the Bureau of Statistics furnishes the following information, derived from official returns, in regard to immigration into the port of New York: There arrived at the port of New York during the month of December, 1879, 9,821 passengers, of whom 8,204 were immigrants. During the corresponding period of 1878 the total number of passengers arrived at the port was 5,321, of whom 3,317 were immigrants. Of the total number of immigrants arrived at the port of New York during the month of December, 1879, there were from England, 1,997; Scotland, 417; Wales, 68: Ireland, 1,158; Germany, 1,932; Austria, 224; Sweden, 330; Norway, 82; Denmark, 65; France, 178; Switzerland, 209: Spain, 17; Italy, 800; Holland, 71; Belgium, 68; Russia, 110; Poland, 197; Hungary, 219; all other countries, 32. The arrivals at the port of New York during the quarter year ended December 31, 1879, and the calendar year 1879, as compared with the corresponding periods of 1878, were as follows;

Quarter ended December 31, 1878: Immigrants, 40,749; citizens of the United States returned, 7,594; sojourners, 1,107; total, 49,450.

Quarter ended December 31, 1878: Immigrants, 17,208; citizens of the United States returned, 9,336; sojourners, 1,240; total, 27,784.

Year ended December 31, 1879: Immigrants, 138,945; citizens of the United States returned, 31,402; sojourners, 5,978; total, 176-325.

Year ended December 31, 1878: Immigrants, 81,505; citizens of the United States returned, 34,333; sojourners, 5,857; total, 121,695.

THE term horse-power is best defined by saying that a horse can pull 520 pounds with a velocity of one foot per second. Several European countries substantially agree in this estimate, as may be seen from the following table:

	Units.	English equiv.
English	550 foot-pounds,	550 ft.-pounds.
French	75 kilogs-metres,	542.47 ft.-lbs.
German	513 fuss-funde,	582.25 ft.-lbs.
Swedish	60 skalpund fot,	542.06 ft.-lbs.
Russian	555 hyt-funt,	550 ft.-lbs.

The product of any force in pounds and its velocity in feet per second, divided by 550, gives the horse-power in operation. One horse-power is 550 foot-pounds of power or effects, or 11-man power of 50 effects each.

Fires.

H. P. Halsey's elevator at Winthrop. Mo., burned with contents Jan. 2nd. Insurance $22,000.

Pennypacker & Co's flouring mill at Wilmington, Del., burned Jan 7th. Loss $100,000. Insurance $55,000.

Perrins' Mills, at Mt. Vernon, Ont., burned Jan. 15th.

Taber & Co's Mill at Horseheads, N. Y. burned. Loss $20,000. Insurance $12,000.

Benefits of Co-operation.

Mr. George Jacob Holyoake, the great English co-operator, spoke recently at the Cooper Institute in this city on the subject of co-operation. He began by telling of the interest he had taken in co-operation all his life. He had, he said, been an active worker in schemes for co-operation in England for years. His first point was as to the benefit of co-operative action to the English immigrants coming to this country. By co-operation, he said, their passage across the ocean could be made a pleasure excursion. Then, too, they could be conducted to places already prepared for them, and thus, by co-operation, they would not be reduced in circumstances so much that they would be left as a burden upon the great cities. In speaking of the Socialist-Labor party, Mr. Holyoake predicted that it would become much larger than it now is in the United States. The laborer would lack common sense, he thought, if he stood idly by while machinery showers gold upon capitalists. In England the times had been such that some people could live without labor, while others could not live with labor. Such a condition of affairs should and can be improved by co-operation. The cry of the Labor party in England was that the government should assist them; but the co-operative workers only asked the government to let them alone and they would get along all right. The speaker then turned his attention to the movement in England, and gave a history of what the supporters of co-operation had accomplished there. The co-operative stores were described as having languished for twenty-five years, and then sprung into success when it was found out that the best plan was to pay 5 per cent. to those who put in capital, and divide the profits among the consumers. An illustration of the extent of the business was the fact that two vessels are now engaged in carrying to England the American produce purchased for the co-operative establishments. Mr. Holyoake surprised the audience in a glowing description of the beauties of the system by declaring that one of its peculiarities was that the larger a member's family was, and the more they ate, the richer he became. By the co-operative bank system members grew rich while they slept, even if they had put in no money. They paid no money, but yet they grew rich. Referring to the subject of co-operative colonization, the speaker thought there ought to be no trouble in establishing co-operative communities. Imagining such a colony of 100 persons on a thousand acres of land, Mr. Holyoake showed how they could make what they needed to wear, and produce what they needed to eat. When they produced more than the colony needed, the surplus could be exchanged with persons outside of the colony. If that could not be done, then the colonists would eat their surplus food themselves, and themselves wear and use their surplus articles of manufacture. Good feeling between employers and employees was advocated at some length by the speaker, who then showed how co-operation would bring about such a feeling. He urged that true information should be given the foreign workingmen regarding the prospects immigrants might expect here, and closed by claiming that co-operation was no Utopian scheme. The Rev. H. Heber Newton, one of the officers of the Co-operative Colony Aid Association, among some remarks made after Mr. Holyoake had finished, explained that the chief peculiarity of co-operation in England was co-operative distribution through co-operative stores; in France it was co-operative production through manufactories; in Germany it was co-operative credit through the co-operative banking system. In this country the first thing the supporters of co operation wanted to do was to enable the distressed laborers in great cities to go in goodly companies to places in the country, where they could live happily in co-operative villages and work together for each other's good. After detailing the hopes and plans of the Co-operative Colony Aid Association, Mr. Newton gave way to Rev. Dr. J. H. Rylance, one of the Executive Committee of the Association, who spoke in eulogy of Mr. Holyoake, and predicted that the time was coming when American workingmen would consider social questions of far more importance than the discussion of political topics.—*Manufacturer and Builder.*

Woman's Nerve.

Virginia (Nev.) *Chronicle:* A tall lady with a saturnine countenance came into the *Chronicle* office to-day and demanded of one of the reporters if Virginia offered a good field for a series of a dozen lectures on Woman Suffrage.

"I don't think the Comstockers have thought much about female suffrage," replied the reporter frankly.

"Don't say *female*," said the tall lady sharply.

"Why not?" asked the reporter, in innocent surprise.

"Because, sir, a term that is used to describe sex in animals should not be applied to woman."

The reporter admitted, in great humiliation, that the point was well taken, and looked up in some alarm at the severe countenance of the lady, who was a head taller than himself and manifestly able to thrash him in the interest of Progress if so disposed. The stern countenance softened somewhat at these signs of confessed inferiority, however, and the lady continued:

"The cause of woman is the cause of humanity. The cause of humity embraces all progress. Why, then, should the people of Virginia be indifferent to woman?"

"They are not," cried the small reporter, hastily. "Far from it. Woman is the boss in this camp. Everything she wants she gets, and not one in a hundred has to do a lick of work."

"Mere toys," said the Tall One, with deep scorn. "Playthings for an idle hour. You would cover woman with silks and gauds and sink her soul to insignificance by circumscribing her sphere and allowing her no mission in life."

"Well," admitted the small reporter, "that's about the way we look at it up here, that's a fact. Women haven't got the nerve to rustle for themselves like men."

"Ner-r-r-ve!" She uttered this word in a terrific tone, so terrified that the small reporter half rose from his chair.

"Nerve! What is there requiring nerve that *you* do *I* am not capable of?"

"No offense, madam, no offense. I meant nothing personal, I assure you."

"Am I not stronger than you?" she demanded, scorning the apology. "Am I not gifted with as great a brain? Why do you despise my sex? We can bear more pain, and are therefore your superiors in courage."

The small reporter was gazing fixedly at a dark corner of the room, and made no answer.

"Nerve, indeed!" continued the tall lady, "Why, women have infinitely more nerve than men. Only yesterday I saw a woman——"

"That's the biggest rat I ever saw in the office," said the small reporter, staring intently at the dark corner.

The scream that rent the air brought in all the printers and several citizens from the street. When they arrived the Tall One was standing on a chair with one hand covering her eyes and the other convulsively clutching at her skirts, as she gathered them close around her.

The small reporter wisely took advantage of the crowd to slip out, and he telegraphed from Gold Hill that he was going down to Carson to work up a big item.

How She Cured Her Husband of Heart Disease.

There is a man up in the Seventh Ward that hasn't spoken to his wife in over a week. He is so mad that he will not go home to his meals, and the other day his wife went to his office to get six dollars to pay for some shoes, and he told a clerk to pay her off and let her go. He grates his teeth when he goes home nights, and comes out of the house every morning swearing. She came a joke on him, that was all. He has for years been telling her that he was sure he had got heart disease, and that he should go off some time in the night. She had got sick of such talk, after hearing it thirteen years, when she knew he was as healthy as a yearling. Why, he didn't even know where his heart was, and couldn't point out the location of any particular portion of his internal improvements. But he kept talking about death every little while, and she said she would break up that game as soon as she could think of any way to do so. A spell ago she bought one of these India rubber water bags, for keeping hot water at the feet, instead of using bottles. It would hold about three quarts, and her husband didn't know anything about it. One night after she had the water bag to her feet a couple of hours, until they were about as warm as a piece of zinc, and her husband was snoring away by note, she thought what a good joke it would be to put it on his stomach and wake him up. She burst right out laughing, at midnight, thinking of it. So she took up the rubber bag of hot water and placed it on his stomach. The bag was about as big as a cow's liver, and as warm as a piece of shingle on a boy. It hadn't been on his chest and other baggage over two minutes before he slowly opened his eyes. She stuffed the upper works of her nightgown in her mouth to keep from laughing. He raised up his head, and said, Harriet, my end has come."

"Which end, Josiah?" said she, as she rolled over, "your head or your feet?" and then she put a pillow into her mouth, and reached over to him and unscrewed the nozzle that holds the water in the bag.

"I am dying, Egypt, dying," said he. "My heart is enlarged to three times its natural size, and O, I am bleeding to death." She had opened the nozzle, and the three quarts of hot water was pouring over him, saturating him from head to heels. She had not meant to let out more than half a pint of water on him, but when it got to flowing she could stop it, so she got out of bed and told him to save himself. He attempted to stop the flow of blood, and she struck a light and asked him if his life preserver had not sprung a leak, and then he looked at the rubber bag, and went and run himself through a clothes-wringer, and he slept on the lounge the rest of the night, and he says his wife is the meanest woman that ever drawed the breath of life. She tells her friends that Josiah has been miraculously cured of heart disease.—*Peck's Sun, Milwaukee.*

Items.

A telegram says that on Jan. 29, at the Blanchard Flouring-mills in Watertown, Wis., a stone burst and a portion of the fragments struck John Howard, breaking one of his legs and injuring his head. Telegram does not state whether it was a mill-stone or grind-stone.

A million-bushel elevator is being built at Dubuque, Iowa.

Herro Cissell's flouring-mill near Georgetown, D. C., burned Jan. 21. Loss on building $50,000; insurance $30,000. Loss on stock $23,000; insurance $15,000.

Five mill-dams have recently been washed out by high water in DeWitt County, Ill.

Jacob Lahr, Esq., of Helvetia, Carver County, Minn., has sold his grist and saw-mills to his son-in-law, R. Zeglin, and Gust Hopping, Esq., of Minneapolis, for the sum of $6,500.

It is said that Minneapolis, after its mills now in construction are completed, will make 16,000 barrels of flour per day. Some leading millers there have orders more than they can fill direct from England, Scotland and Ireland.

Joseph Pike, of Allegan, Mich., lost $2,000 by the floods undermining a flouring-mill and carrying off a dam.

Ogden's mill and distillery, at St. Augustine, twelve miles south of Galesburg, Ill., were destroyed by fire last Saturday night. Loss, $80,000.

Small-pox has appeared at Washington.

Japan has a well-organized bank system.

Hunting parties on the plains of Texas report buffalo scarce.

Arizona contains 73,000,000 acres of land, 5,000,000 of which are surveyed.

Bad weather on the Atlantic has delayed the ocean mail service nearly a week.

London has a society for preventing street accidents and dangerous driving.

Sacramento has a street railroad war, the city trustees going so far as to tear up tracks.

A woman soldier has recently been pensioned and retired from the service by the King of Italy.

The ladies of Paris are wearing entire costumes of fur, sealskin, Astrakhan, and even ratskin.

During last year seven "opera houses" were burned in Texas. They were built of pine boards.

In less than two months twenty-five persons have been shot in Leadville, over two-thirds of this number proving fatal.

The Milwaukee Middlings Millstone Co. have several new mills to build in Pennsylvania.

The Milwaukee Middlings Millstone Co. have another large contract in Colorado.

The new mill in Milwaukee, which is being built by the Milwaukee Middlings Millstone Co., is now nearly completed and will probably start up about the 15th of this month. This mill will be by far the finest mill in the State, if not in the United States. It will have a capacity of 600 barrels per day.

Ewd. P. Allis & Co. have just shipped a car load of machinery to Winona, for the new mill that A. Mowbray is building. This will be one of the largest and finest mills in Minnesota.

C. Manegold & Sons, of Milwaukee, are putting in the Gray bran rolls, furnished by Ewd. P. Allis & Co.

Gardner & Maier, of Hastings, Minn., have ordered one of Gray's patent noiseless roller mills, for middlings, of Ewd. P. Allis & Co,, Milwaukee, Wis.

Mr. Ferd. Schumacher, of Akron, O., is putting in the Wegmann porcelain rolls, ordered from Ewd. P. Allis & Co.

Sidle, Martin & Holmes, of Minneapolis, are putting in 9 set of the Gray patent noiseless roller mills, bought of Ewd. P. Allis & Co.

Ewd. P. Allis & Co., Milwaukee, Wis., have sold another Reynolds-Corliss engine to the Menomonee Iron Co.—size, 16x42—being the second one sold, within a year, to this company.

Ewd. P. Allis & Co., of Milwaukee, Wis., have the contract for building over the Excelsior Mills of C. A Pillsbury & Co., of Minneapolis, to the gradual reduction roller system, taking out 13 run of stone and replacing them with the granulating and porcelain roller mills.

Mr. Stock, of Hillsdale, Mich., is putting in Wegmann's patent porcelain rolls, and the Gray's patent bran rolls, all purchased of Ewd. P. Allis & Co., Milwaukee, Wis.

Wool is selling at 27 cents per pound on the farms in Kendall county, Texas, and the shearing season is yet some time off.

To give an idea of the ravages of diphtheria in Southern Russia, it may be mentioned that in the one province of Pultove, about 7,000 persons have died of the disease in each of the last three years.

Three dogs, two boys and a cat got into a jangle at the foot of Maple avenue yesterday morning, and for a few minutes things were considerably Buttercupped. When the cat got loose it went over a fence with its ideas and tail very much enlarged.—*Danbury News.*

A discussion is now going on in Canada about the number of French Canadians. *Le Canada* asserts that they double in numbers every twenty-eight years. In 1765 they numbered 84,000; in 1877, 1,350,000.

The Normans revived round dances in the twelfth century; the Bohemians invented the redowa, the Poles the polka, and the Hungarians the mazourka and galop. The cotillion is as old as the time of Louis XIV.

The Bey of Tunis is 70 years old, and has no ships, little money and badly armed and dressed soldiers. There are 150,000 Jews in the city—one-fifth of the entire population. The women wear no skirts of any kind; they have long stockings of many hues.

"There are too many women in the world—60,000 more women than men in Massachusetts," growled the husband. "That is the 'survival of the fittest,' my dear," replied the wife.

A Boston man had $65 stolen from him. A week afterward he received a letter containing $25, that read, "I stoled your money. Remors naws at my conshens, and I send you some of it back. When remorse naws again I'll send you some more."

"Aw, my good man, what kind of a wesidence do you think would suit me?" asked an equisite of a house agent. After taking him in, eyeglass and all, the agent replied, "Something like a flat, I should think, would be most appropriate."

Messrs. C. & E. Hawks, of Goshen, Ind., have ordered grooved bran rolls and porcelain middlings rolls of Ewd. P. Allis & Co. Milwaukee, Wis.

Lyman & Co., of Norfolk, Va., are putting in the Wegmann patent porcelain rolls.

Ewd. P. Allis & Co., of Milwaukee, Wis., have just shipped 30 of Gray's noiseless roller mills to Christain Bro. & Co., Minneapolis, Minn.

[Official.]

State Millers' Association.

SIXTH ANNUAL MEETING OF THE IOWA GRINDERS—OFFICERS ELECTED—PREPARATIONS FOR THE INTERNATIONAL EXHIBITION.

The meeting was called in the Council Chamber, President Snouffer, of Cedar Rapids, in the Chair.

Call of roll dispensed with.

The minutes of the semi-annual meeting held at Marshalltown, January 4th and 5th, were passed without amendment. The object of that meeting was to consolidate the Association with the Defense Association, and when that failed the meeting adjourned.

President Snouffer delivered the annual address, as follows:

Gentlemen: In 1870 circulars were sent out inviting the State millers to meet at Waterloo for the purpose of organizing a Millers' Association.

The meeting was well attended; the objects set forth were to embrace: The increase of their products; the protection of their products; the uniformity in prices; the uniformity in transportation, etc. The aim was to form an Association that should command the respect and confidence of every miller throughout the State—its influence to be beneficial to both producer and consumer.

Some fifty delegates were present; an organization was perfected under the above name; constitution and by-laws were adopted; officers chosen, and the outlook gave promise that much good would be accomplished.

During the year and previous to the Chicago fire in 1871, several interesting meetings were held and the Association was on the high road to prosperity. That terrible fire sweeping off millions of property, resulting in ruin and bankruptcy to many, completely disorganized the whole business of the Western country. This element turned the tide of usefulness that had been pictured out but a few months before for the Association. A call for meetings was disregarded; officers failed to give attention to the duties required of them, and the Association, as with many others, went out of existence.

In 1874, financial depressions were being overcome and prosperity again taking hold of every branch of industry, the opportunity was presented for a reorganization of the Association. With the same objects in view as in the first, a meeting was called at Iowa City, in July. Many of the old members, with many others who felt a deep interest in the success of the Association met in pursuance to the call; they adopted a constitution and by-laws, chose their officers, and again started out with the assurance of success in their enterprise.

To-day is our sixth annual meeting at Des Moines, and semi-annual meetings have been held in differeat locations of the State.

This Association has a potent agent in forming a more intimate acquaintance with our brother millers, as well as in forming other organizations, in connection with this, that has resulted in good to all; it has achieved victories that every member should feel proud off.

The affairs of the Association have been conducted with prudence and economy; its expenses are nothing compared to what it has accomplished in bringing such benefits to you that are not to be ignored.

There never was a time when so great progress in all that, which tends to advance the interests of the Association as at this present time; all the elements that belong to that which is noblest and highest in our nature have advanced with our general material prosperity, and as you carry forward the affairs of the Association so shall the results be attained.

For the benefits growing out of the organization I respectfully call your attention to the Mill-Owners' Mutual Fire Insurance Company, and the Iowa Patent Right Defense Association.

The Insurance Company was organized in January, 1875, with headquarters at the city of Des Moines. Constitution and by-laws were adopted, and officers chosen.

In July of the same year it commenced business. The company, through its system of judicious management and economy, has saved many thousands of dollars to the mill-owners in our State, and I need only refer you to the Secretary's report for these facts, which will be presented to-day, it being the fifth annual statement of the Company.

The Defense Association, in connection with the National Association, has contributed largely in protecting its members from the unjust claims and demands attempted to be enforced against them by patent right venders at a cost comparatively small to what it would have been, had the members been without the benefit and advantages arising from such an organization. For the facts connected with this, I refer you to the Secretary's report, which will be presented to you during the sessions of these different Associations.

In conclusion I call your attention to the importance of taking some action on the following subjects:

Uniformity in brands of the different grades of flour, whether for local trade or shipment. Uniformity in prices on the different grades whether at home or in other markets. The expediency of conceding to the millers of the State the right to establish the price of flour in their own market within certain limits based on the market value of wheat. Also, the question of transportation should receive your careful consideration, and, if thought advisable, a committee appointed to confer with those connected with the different lines of railway, with a view to bring about needed changes in the interest of a class of manufactures that contribute more to their prosperity than all other manufactures combined within the State.

The Secretary's report as Treasurer of the Association was read and accepted. It shows a balance of cash on hand of $116.54. A list of delinquent members was read, and the Secretary instructed to notify them, and give 30 days notice, and if they do not pay up, to strike their names from the roll of membership.

The Committee on Constitution and By-laws made a verbal report, to the effect that no change is needed at the present time. Report adopted.

On motion of Mr. Mc Bride, of Rose Hill, a committee of three was appointed by the president to confer with the Atorney General upon the legality of the fish law in requiring fish ways to be constructed upon dams erected before the fish laws were enacted.

On motion of Mr. Graves, Mr. McBride's motion was amended so as to memorialize the Legislature to ameud the fish law and make an appropriation to recompense the mill owners for putling fish ways in dams erected prior to the passage of the fish law.

The Chair appointed as such Committee, Mr. Abner Graves. of Dow City; J. W. Chatburn, of Harlan, and H. Hammond, of Legrand.

Mr, Serrin offered a resolution in relation to the International Exposition. Referred to a Committee consisting of Messrs. Serrin, Knight and Burnham.

Adjourned to meet at 2 o'clock p. m.

AFTERNOON SESSION.

Convention called to order by the President and on motion the Convention proceeded to the election of officers

On motion the Secretary was instructed to cast the ballot of the Convention for Mr. J. J. Snouffer, of Cedar Rapids, for President.

J. B. Jones, of Algona, was elected Vice-President.

J. H. Reed, of Boone, was re elected Secretary and Treasurer.

By ballot the following were elected: Executive Committee, D. B. Knight, of Boone; H. Hammond, of Legrand; C. A. Bryan, of Agency City.

On motion of Mr. Knight the Secretary's salary was fixed at $50 per annum.

On motion an assessment of $1.00 per member was ordered to defray expenses for the ensuing year.

The Committee to whom was referred the Exposition resolution, reported by its Chairman, Mr. Serrin, as follows:

PREAMBLE AND RESOLUTIONS.

WHEREAS, The millers of the United States will hold an International Exposition for the display of mill machinery and mill products in all its various forms, at Cincinnati, Ohio, commencing May 31, 1880, to continue two weeks, and

WHEREAS, The general interest manifested by the trades and industries of both continents in the success of the exposition suggests to this Association the necessity and utility of the milling interest of this State (Iowa) of being fully represented; therefore

Resolved, 1. That immediate steps be taken to secure the proper amount of space for such an exhibition of the milling products of this State as the occasion will warrant.

2. That a committee of five be appointed by this meeting to carry out the spirit of these resolutions and general charge of all matters pertaining to the same, and at once to proceed to secure the necessary space in the building as our wants may require.

3. That each miller in the State be requested to furnish one or more of each grade or quality of flour manufactured at his mill, the same to be put up in packages suitable to the committee.

4. That each miller in the State be requested to send the committee a condensed history of their mills, to include when built, the amount of power, number of run of stone used for the manufacture of flour, and the number for meal and feed, the capacity per day of twelve hours, and the amount of flour manufactured during 1879.

5. That the statistics thus collected be (if the interests taken by the millers justify the same) classified and printed for distribution as in the judgment of the committee may seem best.

6. That the committee be and they are hereby empowered to employ one or more persons as the Secretaries to superintendent the collecting of such matter and statistics and such other duties as they may require of such Secretaries; also, to employ an agent to superintend the collection of such goods as may be contributed by the millers as herein provided and forward the same to Cincinnati and arrange and display the same at the Exposition and have general charge and control of the same during the exhibition.

7. That all flour furnished shall at the close of the exhibition be sold under the direction of the committee and the proceeds shall be applied to defray the expenses of the display, freights etc., included. That the committee of five, constituted of the following gentlemen, J. R. Serrin, D. B. Knight, Abner Graves, H. Hammond, F. J. Woodbury, shall agree to take charge of all flour donated and to furnish all funds necessary to pay freights and properly exhibit said samples and pay all other expenses consequent on such display. And that all flour be sold under direction of said committee and after deducting all expenses the surplus shall be paid into the Treasury of the Iowa Millers' Association.

On motion of Mr. Jones the millers of Iowa are requested to furnish the committee samples of each grade of flour manufactured in packages of 50 pounds weight or more.

On motion it was ordered that the next annual meeting be called at nine o'clock A. M.

On motion a vote of thanks was returned to the city of Des Moines for use of council room.

On motion the Association adjourned to meet at Cedar Falls on the 2nd Wednesday in July, 1880.

MILL OWNERS' MUTUAL INSURANCE,

As many of the members of the State Millers' Association are also members of the Mill Owners' Insurance Company, as soon as the former adjourned it transformed itself into the latter.

After reading and approving the minutes of the last meeting, the Secretary's report was read and adopted. It gives the following statistics in regard to the Mill Owners' Mutual Insurance Company of Iowa for the year ending January 15, 1880: Amount of policies in force at last report, $732,800; amount issued during the year, $252,800. Total, $985,600. Policies canceled, $93,600. Receipts: From assessments, $15,738.77; entrance fees, $1,622.40; back assessments, $60.27; cash on hand at last report, $1,648.24. Total expenditures, $17,807.74. Balance in hand of treasurer, $1,261.92.

The Treasurer, H. Hammond, submitted his report, which was placed on file. It shows, cash receipts, 19,069.68; expenditures, $17,807.75; cash on hand, $1,261.93.

The Finance Committee reported next, and their report was placed on file. The committee reports that the company has been economically managed by both Secretary and Treasurer, which, with the staunch support of the President and Directors, has placed the Mill Owners' Fire Insurance Company on a firm and substantial foundation. The committee says that it to-day has a larger line of risks—adding some $250,000—besides weeding out the past year some $94,000 of poor risks, the showing to-day being nearly $900,000, on the books of the Secretary, which, upon examination, show to each member a larger line and a better class than at any time since the conception of the Company. This has been in a great measure due to the faithful and persistent efforts of the officers of the Company. The committee says the showing of the Company shows a saving of from 60 to 68 per cent per year, over regular Board Insurance rates, and under the control of the parties insured directly, should secure to the company every first-class risk in the State.

Hon. S. D. Nichols, of the Auditing Committee, made a few remarks, showing the advantages of insuring in this Company, and made some complimentary remarks, as to the management.

The reports of the Secretary and Treasurer were ordered printed in pamphlet form for circulation among millers.

Messrs. J. J. Snouffer, S. D. Nichols and J. G. Sharpe were elected directors.

Adjourned until 7:30 P. M.

EVENING SESSION.

At the opening of the evening session the matter of advertising was left with the Board of Directors, the amount not to exceed $100 a year.

S. D, Nichols offered a resolution providing for the election of a financial committee, which was carried, and Messrs. Knight, Jones and McBride were chosen as such committee for the ensuing year.

A motion to revise the articles of incorporation and the by-laws called out considerable discussion, and finally resulted in the Association adopting the motion and appointing Messrs. Knight, Jones, McBride and Nichols a committee to perform this duty to report at the next annual meeting.

After some suggestions in regard to the revision of the constitution and by-laws, and in regard to whether the President of the Board of Directors was President of the company—the members taking the ground that he is not—the Association adjourned.

The Uses of the Potato.

In France the farina is largely used for culinary purposes. The famous gravies, sauces and soups of France are largely indebted for their excellence to that source, and the bread and pastry equally so, while a great deal of the so-called, cognac imported into England from France, is distilled from the potato. Throughout Germany the same uses are common. In Poland the manufacture of spirits from the potato is a most extensive trade. "Stettin brandy," well known in commerce, is largely imported into England and is sent from thence to many of our foreign possessions as the produce of the grape, and is placed on many a table of England as the same; while the fair ladies of our country perfume themselves with the spirit of potato under designation of *eau de Cologne.* But there are other uses which this esculent is turned to abroad. After extracting the farina, the pulp is manufactured into ornamental articles, such as picture frames, snuff-boxes, and several descriptions of toys, and the water that runs from it in the process of manufacture is a most valuable scourer.

For perfectly cleansing woolens, and such like articles, it is the housewife's panacea; and if the washerwoman happens to have chilblains she becomes cured by the operation.

Few persons are aware of the great demand for potato flour, and of the almost unlimited extent of the market that can be found for this product, which is simply the dry evaporated pulp, of the ordinary potato—the whiter and more free from black specks the better. It is used for sizing and other manufacturing purposes, and by precipitation and with the aid of acid is turned into starch. In Europe it meets with a large and increasing demand in its primitive state, as potate flour, and in Lancashire alone 20,000 tons are sold annually, and as many more would be taken if put on the market. When calcined it is used largely for silk dressing and other purposes. At present the quotation for potato flour in Liverpool is nearly double that of wheat flour. Consignments to Liverpool are solicited by the brokers there, who promise to take all that can be furnished.

During the Franco-German war the French Government purchased all the farina it could secure and mixed it with wheaten flour in "potato cakes" for the army. Farina at that time rose to £40 a ton, and even the supply fell far short of the demand. Since then an increased amount of farina has been regularly consumed in France, and farina mills have correspondingly multiplied in that country. The manufacture of potato flour is so simple, and the results so methodical, that it requires very little experience to reach a satisfactory issue. The potatoes are first steeped in water from six to twelve hours to soften the dirt and other matter adhering, after which they are thoroughly washed by mechanical means with the aid of either steam or water power. They are then reduced to a pulp by a rasping or grinding process in a properly constructed mill. A small stream of water is caused to flow on the upper surface of the rasp or grinder, to keep it clean of accumulation of pulp. From the grinder the pulp falls into a washing machine, through which the farina is forced by revolving brushes, the coarser pulp being thrown out at lateral openings. The granules of farina pass into a trough, and are conducted to vats, where the farina is permitted to deposit. After the proper number of filtrations, and depositions have occurred, until the last deposit, which is pure white farina, the latter becomes of sufficient consistency to cut into lumps, and place, either unsupported or in conical wire cases, to dry. The drying process can be accomplished in a building supplied with shelves, and capable of being heated from 60 degrees, at which the farina begins to dry, up to 212 degrees, which is as high a temperature as it will require. The heating apparatus may be such as is most convenient. In Europe the farina is packed in 200 to 212 pound fine sacks, but flour barrels are said to be preferable, as the wood protects it from damage, and allows it to be transported safely to the most distant regions.—*The Journal of Applied Science.*

Cluten Flour for Diabetes.

The two principal constituents of fine wheat flour are starch and gluten. The former is called a carbo-hydrate, and is easily convertible into glucose, or grape sugar; the latter contains nitrogen, and is consequently exceedingly nutritious. Patients suffering from diabetes are always advised to refrain as far as possible from the use of sugar and of amylaceous substances which are easily converted into sugar in the body. Biscuits have therefore been made of flour from which the starch has been removed, and in Paris they may be seen in nearly every bake-shop. Flour of this sort is made in New York, but the bread prepared from it is not very palatable, being, as the patients express it, "chaffy."

In Europe, where wheat flour is more largely employed in making starch than in this country, the gluten which remains after removing the starch is the material used for making buscuits for diabetics; hence its low price there as compared with this country. As may be supposed, it is not absolutely free from starch, and Boussingault, in 1875, published some analyses of such buscuit, showing that they contained more starch than an equal weight of potatoes. It seems, however, that he has analyzed only two specimens, and these must have been unusually poor ones. Birnbaum has analyzed a specimen made made by Henry (77 bis Ave. de Breteuil), and found it much better, as we shall see below. Specimens obtained from different starch factories in Mannheim (Baden) proved greatly superior to those from Paris. As the processes employed in those two cities are quite unlike, a brief description of them may not be without interest to our readers.

In Paris a gluten flour is used which is very rich in nitrogen; but the washed and air-dried gluten would be too tough to permit of being ground finely, hence it is mixed while fresh and moist with about five per cent of flour. The mixture is formed into grains by machinery, and when dry can be easily ground to meal. In this way is obtained a yellowish meal, similar to the German farina. In Paris this is mixed with water and yeast like wheat flour, and baked into bread. The bread is left in the oven until perfectly dried, so that it forms a very dry and brittle sort of buscuit, having the external appearance of other bread but within, full of large holes and cavities enclosed by a semi-transparent skin. It is like the skeleton of ordinary bread; but in the latter the interstices of this frame-work are filled up with crumbs of swollen starch granules.

In Mannheim the pure gluten is used without the addition of other flour. The gluten is washed until the water is no longer milky, then left for twenty-four hours under water. The gluten begins to sour in the mean time, which destroys its great tenacity, so that it can be cut up finely and mixed with sour leaven. As soon as the leaven makes it spongy the dough is baked, or rather thoroughly dried in a bake oven. This bread has the same external appearance as that made in Paris. No flour is added. From one hundred pounds of wheat flour there are obtained twelve to thirteen pounds of gluten bread, which sells for $1.00 per pound of sixty-four biscuit. It is made only in summer, for if kept dry it will remain good for years.

As pure gluten bread has rather a stale taste, the Mannheim company make several other kinds of bread, which are less liable to prove unpalatable to the patient. They sell bread which contains ten per cent. of flour; also that made with prepared almonds, or with inulin. The almonds are chopped up finely, and the sugar and sugar-forming substances removed by means of the proper solvent.

Inulin, made from crude chicory root, is obtained from Witte in Rostock, at $1 00 per pound, and can be safely introduced, because Dragendorf has shown that this carbo-hydrate is not convertible into sugar within the body of a patient suffering from diabetes.

Birnbaum showed by analyses, which he published in a recent number of *Dingler's Journal*, that in consuming 173 parts of potatoes a person takes into the system 40 parts of carbo-hydrates; and that it is necessary to eat only 82 parts of beans to obtain the same quantity of the objectionable sugar forming substance; whereas one can eat 381 parts of Mannheim gluten bread, 317 of the almond biscuit, 147 of the inulin bread, or 138 of Henry's bread, and not exceed the above-mentioned 40 parts of carbo-hydrates.

A NEWSPAPER published at Panama, Dec, 13, contains the following about the Panama Railroad: "The railroad track, as on former occasions, was inundated from Minde, four miles from Colon, to Matachin, a distance of upwards of twenty-seven miles. So high did the water of the Chagres rise that the telegraph wire in the neighborhood of Frijole was entirely under water, thus suspending all communication with Panama. The injury sustained on the line by this flood is considerable and serious. The bridge at Minde was entirely washed away; the two centre piers of the large bridge at Barbacoa were thrown out of the perpendicular, one inclining hither and the other thither, in this way leaving the bridge in an entirely dislocated condition, and, as a matter of course, rendering its transit unsafe, except to foot passengers or light handcars. At Paraiso the earth slid from beneath the rails to the extent, it is estimated, of 200 feet in length. In addition to these, the line suffered in various other places; but the injuries enumerated above are gravest, and therefore the more notable." When the last mail left Colon, on the 17th December, no trains had crossed to Panama for twenty-six days, and there was a prospect of a still further suspension of traffic for weeks to come.

THE MILLER ARNOLD.—Last month the centenary of the punishment by order of Frederick the Great of the judges of the miller Arnold, on the 11th of December, 1779, was celebrated at Berlin. The miller in question was the proprietor of a water mill in the Neumark, and had got into financial difficulties, owing, as is said, to the water of a stream which ran by his mill having been diverted by a neighboring landowner, Baron von Gersdorf, for the purpose of making a fish-pond on the estate. An action for compensation was accordingly brought by the miller against the Baron, but the judges, Rausleben, Friedel and Grann, decided against him. Frederick the Great, on being informed of this decision, sentenced the judges to a month's imprisonment in the fortress of Spandau, and published a decree notifying this sentence in the Berlin papers. In this decree it was stated that "prince and peasant are alike before the law," and that a similar punishment would be inflicted on any other judges "who should deliver so unrighteous a sentence."

WONDERS OF BROOM CORN,—Broom corn is likely at no distant day to revolutionize the breadstuff supply of the world. A process has been discovered by which the finest and most nutritious flour can be made from the seed to the extent of one-half its weight, and leave the other half a valuable food for making beef and milk. The average yield per acre is three hundred bushels, and in many instances five hundred bushels, or thirty thousand pounds have been secured. Nor does it exhaust the soil as Indian corn, from the fact that it feeds from the deeper soil, and assimilates its food from a cruder state. It belongs to the same genus as the sorghum saccharatum, or sweet cane, commonly known as sorghum, which as an article of food is growing rapidly in public esteem, and from the seed of which a most nutritious flour can be made.—*Exchange.*

THE PENNSYLVANIA MILLERS ASSOCIATION.—The above-named association met in regular session at Harrisburg, Pa., Jan. 13, 1880. Pres. Chas. A. Miner in the chair, and A. Z. Schoch secretary. The reports show the Association in a flourishing condition and increasing in membership. All the present officers were re-elected, and Wilkes Barre was selected as the next place of meeting. One of the interesting features of the meeting was a visit to John Hoffers' new 14-run mill now nearly completed. The millers present expressed themselves generally unfavorable to Fultz and Clawson wheats, and urged that efforts be made generally to induce farmers to raise more desirable kinds of wneat.

D. Smith & Co., of Smithfield, Mo., are putting in a new turbine wheel and other machinery for altering their mill.

NEWS.

EVERYBODY READS THIS.

ITEMS GATHERED FROM CORRESPONDENTS, TELEGRAMS AND EXCHANGES.

J. B. Higdon, of Lampasas, Texas, is putting up a custom mill of two run of stones.

Nordyke & Marmon Co., of Indianapolis, Ind., are getting out a five-run new process mill outfit for Major Collins, of Brazil, Ind.

The thirteen-run mill of Hardesty Bros., at Canal Dover, Ohio, is being extensively repaired.

The mill at Neshannock Falls, Pennsylvania, owned by Swogger Bros., is being enlarged and repaired.

J. Stuart's mill, at Reserve, Ind., is being overhauled and new cleaning machinery, bolts, etc., are being added.

S. Brillhart is enlarging his Kendallville (Ind.) mill, and adding new buhrs and other machinery.

A. C. Burnett, of Maquon, Ill., is repairing his mill.

The starch mills, at Peoria, Ill., which were recently destroyed by fire, are being rebuilt. Nordyke & Marmon Co., of Indianapolis, Ind. are furnishing the machinery for the mills, having supplied the machinery for the mill that was burned.

Nordyke & Marmon Co., of Indianapolis, Ind., the well known mill furnishers, having been so crowded with work last season, have commenced large additions to their already immense shops, adjoining property being purchased for that purpose. When these improvements are completed the works will cover fully eleven acres of ground.

R. M. Reel's mill, at Mount City, Ill., was recently almost totally destroyed by fire. He has contracted with Nordyke & Marmon Co., of Indianapolis, Ind., for a complete four-run mill to take the place of the one destroyed.

A new mill is being built at Kansas City, Mo., for Dana & Hank.

A new mill is being built for G. T. Foreacre, of Atlanta, Georgia, by Nordyke & Marmon Co., of Indianapolis, Ind. Hominy, corn flour, grits, etc., will be manufactured.

The old Kilbourn Mills on the canal in Milwaukee have recently been purchased by Mr. Edward Sanderson.

Two mills are to be built at Sauk Centre, Minn. in the Spring. One will have 2 and the other 6 runs of stones.

Hill, Fuller & Co. of Rosario, Argentine Rep., South America, have a 5-run mill with 2 sets of rollers.

Jan. 22d, a young man named Colby Tilton, employed as miller in the flouring mill of White, Listman & Co., at LaCrosse, Wis met a horrible death. He was repairing a leak in the bolt casing near the gearing propelling the machine, when his clothing caught in the gearing and, despite his efforts to save himself, he was slowly drawn in and mutillated in a horrible manner. He remained conscious till his death, five hours later. His parents, living in Maine, have been notified. Tilton formerly worked in Minneapolis.

George C. Dellinger at Pearl Rock, Iowa, three miles South of Nashua, has a fine water-power, a first class milldam on rock bottom and a good stone foundation for a mill. Fall nine feet. He is desirous of forming a copartnership with proper parties for the purpose of erecting a good flouring mill.

The Cockle Separator Mfg. Co. af Milwaukee, Wis., will exhibit their different style of machinery at the comming Millers' International Exhibition, at Cinciunati, Ohio.

The Cockle Separator Mfg. Co. of Milwaukee. Wis., received many orders from large elevators for their machines with large capacity up to 500 bushels; the machines giving entire satisfaction wherever they are in operation.

The wheat in Colorado is full of cockle and many orders from there for Cockle Separators have been received by the Cockle Separator Mfg. Co. of Milwaukee.

Japan has six paper-mills established by American, Germans, and Englishmen. The first of these mills was erected in 1874 at Mila, Yeddo, by an American named Doyle, who, assisted by two other Americans, carried on the business with 150 Japanese workmen.

It is said that the great pencil manufacturer, Faber, who began business in Nuremberg about thirty years ago with a capital of £250, has decided to commemorate this event by setting aside £5,000, the interest of which, at 5 per cent., £250, is to be annually given, under direction of trustees, to some poor and worthy young man who is about to start in business, and is a native of Nuremberg.

The following is a telegram from the government of South Australia dated the 21st inst.: "Reaping commenced in the northern districts of the colony. The season is exceptionally good, a million and a half acres under crop. The expected average is twelve bushels to the acre. It is estimated that there will be for export 375,000 tons of wheat. Splendid rains have fallen throughout the outlying pastoral country and all the dams are full."

It is said the new protective tariff in Germany has already had a marked effect on the price of breadstuffs. Wheat is 33½ per cent. higher, rye 55 per cent., barley 25 per cent., and oats 40 per cent. higher. The German shipping trade has appreciably declined in consequence of the tarriff.

THE land agitation is no new thing in Ireland. In the "Calendar of Documents Relating to Ireland, Preserved in Her Majesty's Public Record Office, London," now publishing in England, we find that 600 years ago the native Celts, after a series of confiscations for the benefit of needy English adventurers, were wont to "often misapply and retain the King's rent."

IMPORTANT NOTICE TO MILLERS.—The Richmond Mill Works and Richmond Mill Furnishing Works are wholly removed to Indianapolis, Ind., with all the former patterns, tools, and machinery, and those of the firm who formerly built up and established the reputation of this house; therefore, to save delay or miscarriage, all letters intended for this concern should be addressed with care to Nordyke & Marmon Co., Indianapolis, Ind.

THE

UNITED STATES MILLER.

Eighth Vol.—Issued Monthly.

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Advantages of Petroleum Lubrication.

A conservatism, founded more on prejudice and want of proper information than anything else, has existed for some years; it clings to the use of animal oils in defiance of reason and economy, but, like all the so-called conservatism, it is gradually yielding to the advancing scientific spirit of the age. There are but few cases in which mineral oils cannot supersede the vegetable and animal oils. Oils from petroleum are now produced suitable for nearly every mechanical process for which the animal oils have heretofore been used, not excepting those intended for cylinder purposes. A serious objection attaching to the animal oils is absent in petroleum. If, through the exhaust steam, some of the oils be carried into the boiler, foaming or priming is the consequence; but the same thing happening in the case of petroleum is rather of benefit than otherwise, for it not only does not cause foaming, but it prevents incrustation or adhesion of the scale or deposit, and this aids in the preservation of the boiler, and is perhaps the best preventive of the many everywhere suggested. Often in removing the cylinder-head and plate covering the valves of an engine, we see evidences of corrosion or action on the surfaces differing entirely from ordinary wear, and the engineer is generally at a loss how to account for it. According to the general impression, grease or animal oil is a preservative of the metal, and is the last thing suspected of being the cause of its gradual disintegration. The reason of this is that vegetable and animal fats and oils consist of fatty acids, such as stearic, magaric, oleic, etc. They are combined with glycerine as a base, and under ordinary conditions are neutral to metals generally, and on being applied they keep them from rusting by shielding them from the action of air and moisture. But in the course of time the influence of the air causes decomposition and oxidation, the oils become rancid, as it is called, which means acid, and they act on the metals. What happens at the ordinary temperature slowly, goes on rapidly in the steam-cylinder, where a new condition is reached. The oils are subjected to the heat of high pressure steam, which dissociates or frees these acids from their base, and in this condition they attack the metal, and hence destroy it. This applies as well to vegetable as to oils of animal origin, fish or sperm oil included. Petroleum, and oils derived therefrom (generally called mineral oils), are entirely free from this objection. Petroleum contains no oxygen, and hence it cannot form an acid, and therefore cannot attack metal. It is entirely neutral, and so bland that it may be, and is, used medicinally as a dressing to wounds and badly abraded surfaces where cercates of ordinary dressings would give pain. The editor of this journal has, since 1866, repeatedly been calling attention to these facts, and now at last we see that they commence to be adopted, and even brought forward as a new discovery by the industrial journals in England—a country very slow in adopting new ideas, especially if they come from this side of the Atlantic. —*Manufacturer and Builder.*

BAD WINTER WHEAT WEATHER.—The past month, on account of the alternate freezing and thawing, has been decidedly bad for fall-sown wheat. The autumn was bad, because it was unusually dry and warm, which, in the great winter-wheat-growing States, had a tendency to spindle the plant and give it a yellowish color. This bad prospect for winter wheat is said to be one of the considerations upon which the New York syndicate base their estimate of the future value of the present wheat crop. They declare that if the winter wheat crop looks very bad in April the price in wheat in this country must be high, because our population has already become so large—50,000,000—that the domestic demand is sufficient to keep the prices stiff. Keene and his clique are breaking the market now, but many suppose that this is done with the intention of buying in more wheat at a lower figure and then lifting it up again to a higher price than it has heretofore reached. But Germany is largely economizing now in the use of wheat, and that economy may cut off the foreign demand upon our market of at least 10,000,000 bushels.

There lives in New Haven, Conn., a man who can lift 1,800 pounds without artificial aid, and another who can lift 700 pounds with one hand.

Ten years ago a colony of poor Swiss settled in Tennessee. They have now a prosperous settlement, and are far ahead of the surrounding poor whites in all the comforts of civilized life.

For Sale or Exchange.

Advertisements under this head $2 per insertion, cash with order.

FOR SALE—A 3-run Grist Mill with two Dwelling Houses and 40 Acres of Land. Address
F. W. HAVERLANDT,
feb2* Trimbelle, Pierce Co., Wis.

FOR SALE—5 run Steam Flouring Mill, or will take a partner. Mill only two years old with modern improvements. Address C. M. WEAVER,
feb2* Waverly, N. Y.

FOR SALE OR EXCHANGE—A 2-run steam Grist and Circular Saw-Mill. Mill is 2½ stories high, 20x72 feet on ground; wood. One acre of ground with mill. Will exchange one-half for good timber land in Missouri, Wisconsin or Illinois, $500 cash and balance on 2 years time. Address, THEO. E. ROWE,
feb-2t, Lexington, Ill.

FOR SALE—One new No. 1 Nagle & McNeal Smut Machine, manufactured at Silver Creek, N. Y. It is a first-class machine, and will be sold at a big discount from the regular price. The owner is not now in the milling business and therefore has no use for the machine. Address at once MILWAUKEE MIDDLINGS MILL-STONE CO., Milwaukee, Wis. jan tf

FOR SALE—At Hill's Ferry, Hertford County, N. C., a valuable Sawmill, with fixtures, situated on the Maherrin River, a stream navigable for large boats. Also a large body of the finest standing pine and oak timber in Eastern North Carolina. Address
d B. B. WINBORNE, Winton, N. C.

STEAM FLOUR MILL FOR SALE—A steam flouring mill, located at Grand Haven, Michigan, two run, with room, power, and business for two more. An outlay of $500 will put the mill in first-rate repair. Grand Haven is the centre of a productive and fast developing farming country. No other mill within fifteen miles of the place. The whole product of the mill may be readily sold at home. Facilities for receiving and shipping by lake and rail unsurpassed. Cheap and on easy terms. Call upon or address the First National Bank, Grand Haven, Mich. d

FOR SALE OR LEASE—The old established flouring mill, known as "Armleders Valley Mills," near Georgetown, Brown County, Ohio. The mill has a good custom, three run of burrs, good water supply, with large brick dwelling, outhouses, stone stable, large tobacco shed, etc., with 77 acres of land. To be sold or leased on very favorable terms. Apply to F. I. MAYER, 159 Dayton street, Cincinnati, Ohio. d

WATER MILL FOR SALE—A merchant mill, situated in Clermont, Iowa, with six run of French burrs and the best machinery throughout. Driven by the best water power in the State. Always plenty of water, with 12 feet fall on solid rock. Located in the best wheat-growing country. Mill building 40x80 feet, five-story brick, near railroad depot. Mill doing a fine business. Mill doing a fine business. Town 1,000 inhabitants, with good schools and churches and good society. Will sell whole on reasonable terms. Reasons for selling, poor health. Address
d3t S. M. LEACH, Clermont, Fayette Co., Iowa.

Situations Wanted, etc.

Millers, Engineers, Mechanics, etc., wanting situations, or mill-owners and manufacturers wanting employes, can have their cards inserted under this head for 50 cents per insertion, cash with order.

SITUATION WANTED—In either a Merchant or Custom Mill. Am not particular as to time needed. Can come immediately if desired, or would make arrangements, to go to work any time between this and April 1, 1880. Having had considerable experience, both in merchant and custom milling, can guarantee satisfaction in all branches of the business. Am willing to go anywhere. Parties answering will please wait a reasonable time for a reply. All letters promptly answered. Address, stating terms, etc.,
MILLER, Box 170, Rauch's Gap, Clinton Co., Pa.
feb1t

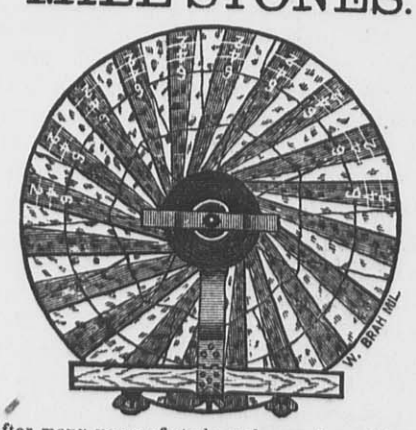
LEHMANN'S

Improved Method of

Truing the Face

—OF—

MILL STONES.



After many years of study and experience I have at last succeeded in discovering a Method of Truing or Staffing the Faces of Mill-Stones, and have secured Letters Patent therefor. My Method has already been introduced into many mills in Wisconsin, Illinois, and many other States, and several of the leading mills in Milwaukee are now using it. The method is simple and comparatively inexpensive, and with its use the faces of stones can be brought to as true a face as can possibly be desired.

This is a result never before accomplished by any staff or method heretofore used. Millers understand the value of such a condition of the stones. Those who take an interest in this, and what miller will not, will do well to address me, and I will send them a circular giving further particulars. My price is very reasonable.

LEHMANN'S

Improved Adjustable

Mill-Stone Bosom Staff.

This is unquestionably the best Staff ever invented for the purpose of securing a proper incline from the eye of the stone to the grinding surface, and still keeping that incline in true face. This Bosom Staff sells at sight to any practical miller. He can see in a few moments how accurately it will do its work. It is suitable for high or low grinding. It can be so adjusted in a few moments as to give any incline desired.

With the use of my Method and IMPROVED ADJUSTABLE BOSOM STAFF work equal to best Roller Mills can be performed. To those that write me, I will take pleasure in mailing an explanatory circular. Address all communications to

WM. LEHMANN,

feb 722 Fourth St., Milwaukee, Wis.

MARRIED FOURTEEN TIMES.—The Little Rock *Gazette* says: "There is now living in Morrilltown, Conway County, a woman who has been married fourteen times. She is now 65 years old, and, matrimonially speaking, she has been remarkably successful. Her fourteenth husband is now living, but it is not known how soon he may drop off, and, considering the epidemic that has raged among his predecessors, his position is one of extreme danger. In the hall of the house where the lady now lives there are thirteen pegs driven in the wall, on which hang thirteen hats labeled John, Tom, Abe, Cill, and so on.

JEWELRY!

$75.00 worth for $15.00,

—AND A—

Solid Abyssinian Gold Watch

FREE!

The above offer is genuine, although at first sight you would consider it impossible. We will explain: Since we first established our business here, March 1st, 1878, we have paid particular attention to the buying of Bankrupt and Auction lots of Jewelry and Watches, often buying at as low as one-tenth their value, and in no instance have we paid over one-sixth the manufacturers' price. Since starting we have always been able to dispose of these goods in Chicago and through our regular customers throughout the country at nearly regular prices, as fast as we could procure them, but owing to the large number of failures among the heaviest dealers and manufacturers throughout this and other countries during the months of June, July and August (the time when the Jewelry business is stagnant), we have now on hand an immense stock of the most desirable goods we have ever handled, and which we have bought at lower prices than ever before. In order to dispose of this entire stock in the most speedy manner possible, and make room for new ones which we shall continue to buy, we have hit upon the following novel plan:

We propose to give you a list of the most desirable of these goods, giving opposite each article its regular retail value, and sell to you at the rate of Five Dollars' worth for $1. For instance, on receipt of 50 cents we will send you, POSTPAID, any article to the value of $2.50; on receipt of $1.00 articles to the value of $5.00, and so on throughout the entire list. Below we give a list of the most valuable of these goods.

List of Jewelry at Wholesale Prices

	Each.
Gent's New Style Scarf Rings or Pins	85c
do Sleeve Buttons, Engraved or Stone Setting	85c
do Bosom Studs, do do	85c
do Round or Long Link Vest Chain and Charm	85c
do or Ladies, Plain, Band, Fancy Stone or Cameo Rings	85c
Ladies' Long or Round Fancy Bosom Pins	85c
do Stone or Engraved Ear-Drops to match	85c
do Engraved and Fancy Cuff Pins	85c
Any three of the above articles will be sent by mail postage paid, on receipt of 50 cents	
Ladies' Broad Band Bracelets, Engraved	$1 00
do First-class Scale Rings, Double Heart, Shield, etc.	1 00
do or Gent's Brilliant Diamond-set Rings	1 00
do Long Fancy Shawl or Bosom Pin	1 00
do Fancy Extension Ear Drops to match	1 00
Gent's Onyx, Amethyst or Topaz Sleeve Buttons	1 00
do Onyx, Amethyst or Topaz Shirt Studs (3)	1 00
do Cameo and other Stone Rings, large	1 00
do Heavy Link Vest Chain and Charm	1 00
do Extra Fine Scarf Rings or Pins	1 00
Any five of the above articles will be mailed free to any address on receipt of $1.00.	
Gent's Long New Style Link Vest Chain and Charm,	$1 45
do Scarf Rings and Pins, New Styles and Extra Fine	1 45
do Heavy Set Stone and Fancy Studs	1 45
do or Ladies' Cameo, Amethyst and Onyx Sleeve Buttons	1 45
do or Ladies' Cameo, Amethyst and other Stone Rings	1 45
Ladies' Long and very Fancy Cuff Pins	1 45
do Extra Finished Onyx, Amethyst and Engraved Pins	1 45
do Extra Finished Onyx, Amethyst and Engraved Ear-Drops	1 45
do Long Opera or Guard Chains	1 45
do Fancy Neck Chains and Charm	1 45
Any six of the above articles will be mailed free on receipt of $2.00.	
Gent's Solitaire or Cluster Australian Diamond Pins,	$1 90
do Single Stone Australian Diamond Studs (3)	1 90
do Heavy Large Solitaire Australian Diamond Single Stud	1 90
do Fine Finished Long Link Vest Chain and Charm	1 90
Gents Very Nobby and Latest Style Scarf Rings and Pins	1 90
do or Ladies' Cameo, Onyx and Amethyst Sleeve Buttons	1 90
Ladies' Etruscan Necklaces, very heavy	1 90
do Long Opera and Guard Chains, very heavy	1 90
do Australian Diamond and other Fancy Pins and Ear-Drops	1 90
do Stone-set and other Fancy Cuff Pins	1 90
do Heavy Engraved Locket for Miniatures	1 90
do Chased Bracelets, Broad, extra heavy	1 90
Any eight of the above articles you may select will be mailed to you free on receipt of $8.00.	
Ladies' Fancy Neck Chain and Medallion Charm in Fancy Lined Jewel Casket	$2 50
do Long Opera Chain, with or without Slide and Tassel	2 50
do Heavy Large Miniature Medallion Locket	2 50
do Heavy Jet and Gold Bracelets	2 50
do Cameo Medallion Pin and Ear-Drops	2 50
do or Gent's Massive Wedding Ring, Plain or Band	2 50
do or Gent's Extra Large Cameo, Amethyst or Onyx Rings	2 50
do Long Shawl or Breast Pin, finest quality	2 50
do Long Fancy Cuff Pins, do	2 50
do or Gent's Cameo, Amethyst or Onyx Sleeve Buttons	2 50
Gent's Heavy Long Link Massive Vest Chain	2 50
do Cluster or Solitaire Central American Diamond Pins	2 50
do Stone and Fancy Leaf Scarf Pins and Rings,	2 50
do do do Pattern Studs (3)	2 50
do Massive Solitaire Stud	2 50
Any ten of the above articles will be sent by mail free on receipt of $5.00.	

All of this Jewelry is of good quality, but of course, the quality depends greatly on the price; for instance, the $2.50 articles are of a much finer quality and finish, besides being heavier, than the 85c ones.

TO AGENTS.

For the benefit of parties wishing to act as Agents for the above goods, we make the following special offer:

On receipt of a $15.00 order for our Jewelry, as per above offer, we will send the goods ordered, and make the party getting up the club a present of any of the following Watches:

1 Pure Abyssinian Gold Hunting-Case Geneva Watch.
1 Pure Abyssinian Gold Open Face Geneva Watch, Stem-Winder.
1 Pure Abyssinian Gold Stem-Winding Watch, Illuminated Dial, by which you can tell the time in the darkest night.
1 Pure Abyssinian Silver Hunting-Case Geneva Watch.

Any of these Four Watches will be sent alone for $6.50, or the Watch and either a Gent's Heavy Abyssinian Gold Vest Chain and Charm, or a Ladies' Solid Abyssinian Gold Long Opera or Opera Guard Chain, for $8.00.

Agents who cannot send the full $15.00 at once can send small orders as they procure them, and when said orders shall have amounted to $20.00 we will send the Watch FREE OF FURTHER CHARGE.

Read What the Chicago Press Say of Us. And Send in Your Orders.

The *Sentinel*, of Chicago, Sept. 9, says: "We call the attention of our readers to the new advertisement of the Inventors' Agency, No. 116 E. Washington Street, Chicago. What the Inventors' Agency agrees to do, they will do. The *Sentinel* has advertised for the concern since its publication, and we have yet to hear of the first complaint against it."

The *Chicago Express*, Sept 3d, says. "The attention of readers is called to the advertisement of 'The Inventors' Agency,' office and rooms located at 116 E. Washington St., Chicago. From personal inquiry and on the recommendation of the city press, we think our friends can do no better when wanting goods in that line. Give them a trial."

The *American Stockman*, Sept. 11th, says: "We believe this institution perfectly sound and responsible, and consequently persons need have no hesitation about sending for what they desire."

As to our responsibility we also refer you to the following firms:

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All sums of money to the amount of $1.00 or over, should be sent by Registered Letter, Money Order or Draft on New York or Chicago. We will hold ourselves personally responsible for any money sent as above directed. All orders under $10.00, strictly cash. On orders of $10.00 or over, $5 00 must accompany the order, and balance, when desired, will be collected on delivery, but no goods will be sent C. O. D. to a greater distance than 500 miles. Any money received for these goods after the stock is exhausted will be immdeiately returned. Postage Stamps will be taken the same as cash in any amount less than $100.

If on receipt of goods you are not perfectly satisfied, return them immediately in good order, and we will refund your money.

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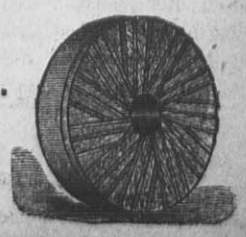

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